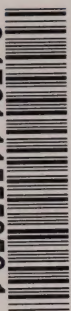



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du Canada

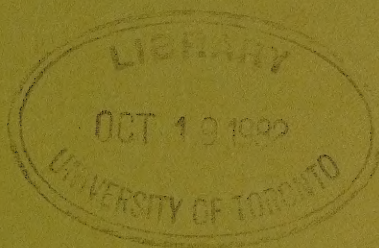
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Examen des évaluations
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INFORMATION SURVEY - KINDS AND SOURCES - FOR THE
ENVIRONMENTAL ASSESSMENT REVIEW PROCESS:
BEAUFORT SEA HYDROCARBON PRODUCTION AND TRANSPORTATION PROPOSAL



compiled by
Elsie M. MacDonald

for the
Federal Environmental Assessment Review Office
Hull, Quebec

October, 1981

Canada

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INFORMATION SURVEY - KINDS AND SOURCES - FOR THE
ENVIRONMENTAL ASSESSMENT REVIEW PROCESS:
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- I.1 Published Report List
- I.2 Index to Agency Information Sheets
- I.3 Agency Information Sheets

SECTION II: PROJECT INFORMATION

- II.1 List of Project Information Sheets
- II.2 Subject-by-Topic Index
 - II.2.1 Category Descriptions
 - II.2.2 Index to Project Information Sheets
- II.3 Project Information Sheets

for the
Federal Environmental Assessment Review Office

October, 1981

1. ACKNOWLEDGEMENTS

This report was prepared under contract to the Federal Environmental Assessment Review Office under the auspices of the Secretariat for the Beaufort Sea Panel. Appreciation is extended to the Secretariat for their support and assistance throughout the Survey.

The contributions of all who responded to the Survey is gratefully acknowledged. The efforts expended by those individuals to identify any involvement within the scope of the review of the Beaufort Sea Hydrocarbon Production and Transportation Proposal have made this report possible.

The author would like to thank Ms. Mary-Margaret Healy for her assistance throughout the project and Mrs. Ginette Crites for recording all responses on word processor.

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3. SUMMARY

This report contains the responses to a survey undertaken to determine kinds and sources of information available to participants in the Environmental Assessment and Review Process (EARP) as applied to the Beaufort Sea Hydrocarbon Production and Transportation Proposal.

The first section of the report deals with information sources in general and consists of 60 Agency Information Sheets. Each information sheet identifies a contact for the agency, as well as objectives, areas of expertise, relevant current projects, publications and information services of that agency.

The second section contains more specific information on kinds of data available in the form of 162 Project Information Sheets. Each sheet covers a current or recently completed (approximately 1979) project. Information provided includes project objectives, approach and/or progress, anticipated time frame, reports or publications, agencies and researchers involved, and a contact for additional information. Relationship of individual projects to the Environmental Assessment Review Process of the Beaufort Sea Hydrocarbon Production and Transportation Proposal is indicated with a subject by zone index.

4. INTRODUCTION

4.1 Background

In July 1980, the Minister of Indian Affairs and Northern Development referred the Beaufort Sea hydrocarbon production and transportation proposal for review under the Environmental Assessment and Review Process (EARP). The review was to consider all aspects of hydrocarbon production in the Beaufort Sea and its ancillary facilities north of 60° latitude. Transportation routes (pipeline and/or ice breaker tanker) were to be included. Socio-economic aspects as well as environmental ones were to be considered.

The Federal Environmental Assessment and Review Office (FEARO) initiated, as part of its secretariat support role to the Environmental Assessment Panel, an information survey to determine amounts, kinds and sources of information available to the Environmental Assessment Panel, intervenors and proponents.

4.2 Objectives

The objective of the information survey was to provide the Environmental Assessment Panel with information relevant to the major issues that are to be addressed throughout the review process by:

- identifying sources of biological, physical and sociological information related to hydrocarbon production in the Beaufort Sea and alternative modes of transportation to southern markets.
- collecting information as to ongoing programs or current research efforts that are related to hydrocarbon development in the Beaufort Sea or transportation to southern markets.
- summarizing or ordering this information in relation to major project components, identified environmental or social issues, or zones of activity.

4.3 Approach

An initial "personal contact" approach proved too time consuming and limited in scope, and was supplemented by a Mail Survey (Section 5).

4.3.1 Survey Coverage

The mailing list for the Survey included:

- participants of the Seminar (Calgary, November 10, 1980) held by FEARO on the Beaufort Sea Hydrocarbon Production and Transportation Proposal and parties who had otherwise expressed an interest to FEARO in the Panel review.
- participants in the Montebello Workshop "Frontier Oil and Gas Development the Decade Ahead".
- selected agencies from "Directory of Marine Scientists in Canada - 1980". Canadian Special Publication of Fisheries and Aquatic Sciences No. 46.
- selected agencies from "Guide to Marine Transportation Information Sources in Canada". Transport Canada Report No. TP2431.

4.3.2 Subject Coverage

Information relating to either environmental or social aspects of hydrocarbon production in the Beaufort Sea and its transportation to southern markets by either pipeline or ice breaker tanker or both was requested at two levels:

- A. Agency Information was requested to identify in general terms the areas of interest and expertise of agencies (government, industry, universities, private enterprise) and their subdivisions, and to identify information services provided.
- B. Project Information was requested to provide more specific information as to data collection on "who is doing what and where".

4.4 Report Organization

The report consists of Section I and Section II covering the responses to the Agency Information Format and the Project Information Format respectively.

Section I. Information Sources

Agency information responses and a list of references to other information source compilations are included. Agency information is located within the following categories in order of file entry (i.e. Agency Information Sheet No): Associations, Commercial Enterprises, Educational Bodies and Government.

Section II. Project Information

Project information responses are presented in order of a file number assigned on entry to word processor (Project Information Sheet No). An index is provided by subject category for each of the three zones defined for the review of Beaufort Sea Hydrocarbon Production and Transportation Proposal. (In Draft Guidelines for the Preparation of an Environmental Impact Statement, The Beaufort Sea Hydrocarbon Production Proposal, Beaufort Sea Environmental Assessment Panel, June 1981.)

4.5 Limitation and Future Plans

The comprehensiveness of the Survey has been limited by the Survey coverage and unwillingness of some groups to participate in the Survey. Other projects are still in the planning stage and not yet available for publication. Recognizing these limitations, the report is being submitted at this stage as a working document in the interest of timing for Panel use.

Corrections to current entries and additions for a "reviewed update" are invited. The current report has been entered on word processor discs to facilitate revision and has been organized using file numbers rather than page numbers to allow entry of new projects on a continual basis.

Responses should be addressed to the:

Federal Environmental Assessment Review Office
13th Floor, Fontaine Building
Hull, Quebec
K1A 0H3
Attention: Ms. E. MacDonald

5. SURVEY FORMAT

Hull, Québec
K1A 0H3

1981.05.05

To: Potential Participants, Environmental Assessment Review of the
Beaufort Sea Hydrocarbon Production Proposal

This letter is addressed to all potential participants in the Environmental Assessment Panel review of the Beaufort Sea Hydrocarbon Production proposal. This includes participants of the Calgary Seminar held by the Federal Environmental Assessment Review Office (FEARO) on the Beaufort Sea Hydrocarbon Development Proposal, participants in the Montebello Workshop "Frontier Oil and Gas Development - the Decade Ahead", and parties who have otherwise expressed an interest to FEARO in the Panel review or who have been identified as potential participants in the review.

The Federal Environmental Assessment Review Office has initiated an Information Survey to assist the Beaufort Sea Panel in its activities. The objectives of the survey are to identify sources of biological, physical and sociological information relevant to the Beaufort Sea Hydrocarbon Production Proposal, and to organize this information and information that the Panel may receive over the review period in terms of major project components or identified environmental and social issues. The Beaufort Sea Hydrocarbon Production Proposal covers the concept of hydrocarbon production in the Beaufort Sea and its transportation to southern markets by either pipeline or ice breaker tanker or both.

The current priority of the Information Survey is to identify recently completed or ongoing projects which contribute or will contribute to the information base for the Panel review and to identify centres of expertise in specific subject areas. As examples of the type of information desired, format sheets have been drawn up to cover collection of information at two levels:

- A. Agency "Involvement" Sheets. This information will be used to compile an overview section which will identify in general terms the areas of interest and expertise of agencies (government, industry, universities, private enterprise or other interested groups) and their sub-divisions, and to identify information sources and information services provided.
- B. Project Information Sheets. These will be compiled to provide more specific information as to "who is doing what and where".

As interested participants in the Environmental Assessment and Review Process (EARP) of the Beaufort Sea Hydrocarbon Production Proposal I wanted to take this opportunity both to inform you of the direction of the Information Survey and to request your assistance.

I am enclosing a copy of the Format Sheets as guidelines and would appreciate receiving information either of an overview nature or on specific projects which you feel could be relevant to the Panel review process or will assist the Panel in identifying areas of expertise they may call upon. I would be pleased to discuss this further and try to answer any questions you may have. I can be reached through the FEARO office in Ottawa. (819-997-1000).

In order to meet an August deadline that will allow the Beaufort Sea Panel to consider the information in the early planning process, replies must be received by mid-June. An early reply will facilitate my job of compilation of the material and will be greatly appreciated. Please indicate in your reply your opinion as to the usefulness of this survey to you as an EARP participant, and whether you would like to be notified of the availability of this report when it is completed.

Yours very truly,

A handwritten signature in dark ink, appearing to read "E. MacDonald", written in a cursive style.

E. MacDonald

Please send replies to:

Ms. E. MacDonald
Federal Environmental Assessment Review Office
13th Floor, Fontaine Building
Hull, Québec
K1A 0H3

Information Survey for the Environmental Assessment Review Process-
Beaufort Sea Hydrocarbon Production Proposal

A. Format - Agency Information Sheet.

1. Agency and Address. (Government department, associations, universities, commercial enterprises, or any sub-division of these).
2. Contact (Phone No.)
3. Responsibilities or Objectives. Identify objectives applicable to areas north of 60°, or specifically to the Beaufort Sea Referral.
4. Areas of Expertise. Identify activities or areas of expertise relevant to the assessment of the Beaufort Sea Proposal.
5. Specific Project Information. List current projects relevant to the Beaufort Sea Proposal and attach project information sheets.
6. Information Services. Identify information services (library, data bases, etc.) and accessibility of information.
7. Publications. List publications of a general nature (Bibliographies, annual reports, summary reports, newsletters etc.)

The Beaufort Sea Hydrocarbon Development Proposal covers both environmental and social impacts of hydrocarbon production and transportation to southern markets.

Information Survey for the Environmental Assessment Review Process
- Beaufort Sea Hydrocarbon Production Proposal

B. Format - Project Information Sheet

1. Project Title
2. Geographic Study Area
3. Objectives
4. Approach and/or Progress
5. Reports or Publications
6. Anticipated Time Frame
7. Undertaken by:
 1. Agency
 2. Research Personnel
8. Contracted or funded by: (if applicable)
 1. Agency
 2. Scientific Authority
9. Contact:
Address and phone number

Include current or recent (1979-1981) projects relevant to any aspect of the "Beaufort Sea Hydrocarbon Development Proposal" as referred to the Environmental Assessment and Review Process. The referral covers both environmental and social impacts of hydrocarbon production and its transportation to southern markets.

6. SUMMARY LIST OF AGENCY AND PROJECT INFORMATION SHEETS

The following list summarizes the contents of the body of this report. Agency Information sheets are listed under the four categories used in Section I (Associations, Commercial Enterprises, Educational Bodies, Government) and are listed in order of appearance in Section I. The Project Information Sheets submitted by the agencies are listed in association with that agency. These sheets appear in Section II of the report in order of assigned Project Information Sheet Numbers.

SUMMARY LIST:

Agency Information Sheets	Agency File No.	Project Information Sheet No.
<u>Project Information Sheets</u>		

ASSOCIATIONS

Beaufort Sea Advisory Committee	A-1	
Arctic Petroleum Operators Association	A-2	
APOA projects - General		27

COMMERCIAL

Woodward - Clyde Consultants	C-1	
Coastal characteristics of the Northwest Passage.		81
Regional Analysis study of the western Arctic Archipelago Marine Region #4		82
Parks analysis Natural Region #26		83
Shoreline analysis, Alaska & Arctic Canada		84
Coastal geology mapping, central Sverdrup Basin, N.W.T.		85
Beaufort Sea coastal video survey		86
Northwest Passage video-tape survey		87
BIOS Oil Spill		88

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
APOA Beaufort Oil Spill Workshop		89
AMOP spill site selection		90
EAMES Atlas Workshop		91
Southeast Newfoundland oil spill countermeasures study.		92
D.F. Dickins Associates Ltd.	C-2	
Long term fate and effects of Balaena Bay oil spill		43
Study of ice conditions along a year round shipping route from the Bering Strait to the Canadian Beaufort Sea, June 1979.		44
Air deployable oil spill ignitor tests, Yellowknife, May 1979.		45
Oil and gas under sea ice, Dec. 1980		46
Ice conditions along Arctic tanker routes (to be included in volume 3 of Dome's Beaufort Sea Production, E.I.S.)		47
CanOcean Resources Ltd.	C-3	
Frontier subsea pilot production project (Beaufort)		68
Extended well production test riser system for Dome Petroleum		69
The feasibility of underwater containment of subsea oil spills in Arctic waters (Oil spill containment study - 1979)		70
Subsea containment study task 3 (C-CORE: 426-0)		71

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
Desing study of oil skimmer for use in Canadian waters		72
Arctic Pilot Project (A.P.P.)		73
4th Service System design (Arctic service system - In-house R & D)		74
E.R. Walker	C-4	
Pallister Resource Management Ltd.	C-5	
Acres Consulting Services Ltd.	C-6	
Tuktoyaktuk Harbour Master Plan		93
Economic development plan.		106
Oil and gas exploration supply base		107
Geotechnical investigations of proposed Mackenzie highway.		108
Yukon grizzly bear studies		109
Study of the tourism potential for the Mackenzie Valley communities.		110
Market opportunities - North of 60°		111
Transportation feasibility studies		112
Financial analysis of Arctic pipeline applications.		113
Artec Canada Ltd.	C-7	
Acres Santa-Fe Incorporated	C-8	
Transportation of gas and oil from the Arctic Islands		94
Laboratory study of heat transfer at ice/water interface.		95

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
Tanker terminals feasibility for a petrochemical complex.		96
Feasibility study, deepwater transshipment storage facility.		97
Risk analysis for pipeline construction		98
Oil and gas production facilities for offshore Labrador		99
Ice management for Arctic LNG terminal.		100
Compilation of ice forces against structures		101
Ice studies for exploratory drilling system		102
Crossing of ship tracks in Barrow Strait		103
Stress analysis of Barrow Strait ice cover		104
Production and gathering system; Design and project management		105
Interdisciplinary Systems Ltd.	C-9	
Hire North evaluation study		119
Socio-economic impact assessment of the Arctic Pilot Project on selected high Arctic communities.		120
Assessment of the socio-economic impacts and damages resulting from the Grand Rapids 1960-1980 (with projections to year 2000)		122
Construction and use of winter roads during pipeline construction, to reduce terrain and vegetation impacts		123

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
Candidate Natural Areas of Canadian Significance and Natural Sites of Canadian Significance in Natural Region 8 and in Natural Region 7.		124
Regulatory consulting services to private industry.		125
Beaufort Environmental Support Services Ltd.	C-10	
MacLaren Plansearch	C-11	
C.H. Templeton & Associates, Consultants	-	
Workshop on the impact of the Dempster Corridor on the Mackenzie Delta		24
Dome Petroleum Ltd.	C-12	
Oil Spill Prevention/Cleanup/Impact Production: Current Projects 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.		1
Ice Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.		2
Remote Sensing Program 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.		3
Geotechnical Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.		4
Oceanographic Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.		5
Research Program for Canmar Kigoriak, An Experimental Class 4 Icebreaker (1979-1980). Beaufort Sea Production Development. Dome Petroleum Ltd.		6

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
Biological - Chemical Research 1980, Beaufort Sea Production Development. Dome Petroleum Ltd.		7
Beaufort Sea Production Environmental Studies 1979-1980. Beaufort Sea Development. Dome Petroleum Ltd.		8
Oceanographic and Sea Ice Research 1979- 1980. Beaufort Sea Production Development. Dome Petroleum Ltd.		9
Oil Spill Research 1979-1980. Oil Spill Prevention/Cleanup/Impact Prediction: Recent Studies 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd.		10

EDUCATIONAL BODIES

University of Ottawa, Dept. Geography	Ed-1	
Terrain, land use and waste drilling fluid disposal problems adjacent to exploratory wellsites in permafrost, Arctic Canada.		57
The study of coastal processes and dynamics, Southwest Banks Island, Western Canadian Arctic.		58
Memorial University, Ocean Engineering Group	Ed-2	
C-CORE (Centre for Cold Ocean Resources Engineering)	Ed-3	
Ocean Engineering Information Centre (OEIC)	Ed-4	
Arctic Institute of North America	Ed-5	
Boreal Institute of Northern Studies	Ed-6	
Arctic Science and Technology Information System	Ed-7	

<u>Cont:</u> <u>Summary List (Agency and Project)</u>	<u>Agency</u> <u>File</u> <u>No.</u>	<u>Project</u> <u>Information</u> <u>Sheet No.</u>
University of Toronto	-	
Studies of behaviour and effects of oil spills in Arctic lands and waters and spill countermeasures, especially chemical dispersion.		64
Dalhousie University, Institute for Resource and Environmental Studies	-	
Ecological basis for environmental impact assessment in Canada.		160
University of Waterloo, Faculty of Environmental Studies	-	
Applicability of Scottish shore experience to Canadian Beaufort Sea development.		161

GOVERNMENT

<u>Govt 1: Bedford Institute of Oceanography</u>	G1-1	
<u>Govt 2: Energy, Mines & Resources Canada</u>		
Earth Physics Branch, Division of Seismology and Geothermal Studies (<u>Seismology Studies</u>)	G2-1	
Geological Survey of Canada, Resource Geophysics and Geochemistry Division	G2-2	
Sub-seabottom permafrost mapping - Beaufort Sea		65
Earth Physics Branch, Division of Seismology and Geothermal Studies (<u>Geothermal Service</u>)	G2-3	
National Energy Program - Energy R & D Oil and Gas Task 3.26 - Offshore temperature studies.		75
National Energy Program - Energy R & D: Oil and Gas Task 7.6. Study of shallow thermal aspects for pipelining.		76

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
National Energy Program - Energy R & D: Oil and Gas Task 3.1. Fundamental studies of moisture migration.		77
National Energy Program. Energy R & D: Oil and Gas Task 2.2. Geological and geophysical studies of gas hydrates.		78
Canada Centre for Remote Sensing	G2-4	
Radarsat Project		114
Geological Survey of Canada, Atlantic Geoscience Centre	G2-5	
Coastal Reconnaissance of the Sverdrup Basin, N.W.T.		20
Coastal Reconnaissance of Bylot and N.E. Baffin Islands, N.W.T.		21
Coastal erosion - sedimentation, Northern Somerset Island, N.W.T.		22
Establishment of environmental design parameters for Beaufort Sea development - Geotechnical information requirements.		23
<u>Govt 3: Employment and Immigration Canada</u>	G3-1	
<u>Govt 4: Environment Canada</u>		
Lands Directorate, Land Resource and Data Systems Branch	G4-1	
Northlands Ecoregions		15
Ecodistrict mapping for the Northwest Territories.		16
Ecological baseline information system for the Beaufort Sea Planning Area.		17
Atmospheric Environment Service, Ice Branch	G4-2	

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
Atmospheric Environment Service, Western Region	G4-3	
Environmental aspects of Arctic marine transportation: Sea state, ice and weather.		35
Annual reports of Beaufort Weather Office (BWO).		36
Atmospheric Environment Service, Meteorological Services Research Branch	G4-4	
Operational Systems design R & D		37
Satellite ice status system R & D		39
Marine oil spill trajectories R & D		40
Wave and swell forecasting R & D		41
Sea-Ice modelling R & D		42
Northern Hydrology Service, Surface Water Division	G4-5	
Lakes regime, Mackenzie Delta, N.W.T.		61
Ice regime of lower Mackenzie River and Mackenzie Delta.		62
Northern highways hydrology study, Mackenzie Delta region, N.W.T.		63
Canadian Wildlife Service - Seabird Research Unit, Migratory Birds Branch, Atlantic Region	G4-6	
Hudson Strait seabird study - year 2 of 3		66
Seabird population studies in Lancaster Sound and vicinity.		67
Environmental Protection Service, Yukon	G4-7	

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
Arctic Marine Oilspill Program (AMOP).		51
Atmospheric Environment Service - Central Region	G4-8	
Atmospheric Environment Service - Arctic Meteorology Section, Applications and Impact Division	G4-9	
Offshore wind/wave climate studies		30
Climatic study of northwestern Baffin Bay.		31
Regional climate study of the Canadian Arctic Islands and adjacent waters.		32
Arctic air temperatures relevant to steel selection for ship hulls		33
Climatic change in the Arctic		34
Parks Canada, National Parks Branch	G4-10	
Northern Technology Unit, Water Pollution Central Directorate	G4-11	
Northern Technology Unit Projects		80
Canadian Wildlife Service - Western and Northern Region	G4-12	
Responses of Peary caribou and muskoxen to helicopter harassment.		59
Inter-island movement of Peary caribou		60
Environmental Emergency Branch	G4-13	
Arctic Marine Oilspill Program		28
Environmental Protection Service, NWT	G4-14	
Beaufort coastal survey.		126
Mckinley Bay, Beaufort Sea		127

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
Ocean dumping standardization		128
Federal Environmental Assessment Review Office	G4-15	
Environmental Assessment Panel Projects.		162
Federal Activities Assessment Branch	-	
Onshore impacts of offshore hydrocarbon development: An annotated bibliography.		140
<u>Govt 5: Fisheries and Oceans Canada</u>		
Economic Policy & Marketing	G5-1	
Arctic Biological Station	G5-2	
Microbiology of water and sediments at Issunguak Artificial Island		55
Scientific Information and Publications Branch	G5-3	
Marine Environmental Data Services Branch	G5-4	
Wave climate study.		56
Ocean Science and Survey - Atlantic Oceanographic Laboratory	G5-5	
Physical Oceanographic Program		25
Marine pollution chemistry		26
Ocean Science and Surveys - Marine Ecology Laboratory	G5-6	
Fisheries and Oceans - Western	G5-7	
Monitoring and assessment of the commercial fishery potential in the Mackenzie Delta.		129
Mackenzie Delta - Beaufort Sea Project		130

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
Tuktoyaktuk Lakes Study		131
Subsistence Beluga/Narwhale exploitation - Mackenzie Delta and Baffin area.		132
Energy related organics		133
Metals in Arctic ecosystems		134
Heavy metal and hydrocarbon monitoring in sediments and fishes along the Tuktoyaktuk Peninsula.		135
Coastal migrations: Spawning areas.		136
Water quality monitoring in Tuktoyaktuk Harbour.		137
Data inventory of Bowhead and White Whales in the Beaufort Sea and adjacent marine waters		138
Review and assessment of existing data for fish and marine mammals in the Beaufort Sea hydrocarbon production area and along possible transportation corridors		139
Ocean Science and Surveys, Central Research and Development Division	G5-8	
Oceanographic monitoring in Barrow Strait		115
Ice studies in the Central Arctic		116
G-UMPS (Gyroscope unmanned profiling system).		117
Oceanography of Hudson/James Bays		118
Oceanographic Information Division, Institute of Ocean sciences	G5-9	
Case studies directed towards defining major physical and chemical fluxes and determining chemical mass balances for the Beaufort Sea in general.		11

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
Review and assessment of existing data for the marine science disciplines in the Beaufort Sea Hydrocarbon Production Area.		13
Beaufort Sea Studies: Ocean Information Division.		14
Data inventory of Bowhead and White Whales in the Beaufort Sea and adjacent marine waters		138
Institute of Ocean Science	-	
Sea ice motion in the southeastern Beaufort Sea, 1978.		48
Beaufort Sea winter ice experiment 1979: Oceanography		49
Beaufort Sea winter ice experiment 1981: Oceanography.		50
Physical oceanography in the Northwest Passage.		53
Fish, invertebrates and marine plants of the southern Beaufort Sea - An overview.		54
Canadian Hydrographic Service, Atlantic Region	G5-10	
<u>Govt 6: Indian Affairs and Northern Development Canada</u>		
Northern Affairs Program, Inuvik Office	G6-1	
Water resources officer - Northern Affairs Program, Northern Operations Branch, District Operations, Inuvik, NWT		79
Northern Research Information and Documentation Service, Northern Social Research Division	G6-2	
Northern Environmental Protection Branch, Northern Environment Directorate	G6-3	
Uptake and retention of petroleum hydrocarbons in tissues of benthos.		141

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
Northern land use information series mapping project.		143
Office of Native Claims, NWT and Labrador Group	G6-4	
Negotiation of the a) I.T.C. and b) DENE/METIS claims.		142
Program Services, Indian and Inuit Affairs Program	G6-5	
Library Services, Information Resources Division, Finance and Professional Services Program	G6-6	
Major Projects Assessment Branch, Northern Affairs Program	G6-7	
Northern Statistical Information Centre, Data Management Division, Northern Affairs Program	G6-8	
<u>Govt 7: National Research Council</u>	G7-1	
<u>Govt 8: Northern Canada Power Commission</u>	G8-1	
Expanded power supply alternatives for Inuvik - Tuktoyaktuk area.		52
<u>Govt 9: Public Works Canada</u>	G9-1	
OTHER: PUBLICATIONS		
EAMES - Eastern Arctic Marine Environmental Studies		29
Historical development of current patterns of Inuit culture and implications with respect to future development.		144
Bowhead whale distribution and movement study.		145
Arctic Seas study		146

Cont: Summary List (Agency and Project)	Agency File No.	Project Information Sheet No.
Bowhead whale behaviour		147
Northern Shore zone management (II)		148
Legal aspects of marine transit in the Arctic.		149
Effects of spilled crude oil on micro-organisms.		150
Ecology of the Canadian Arctic Archipelago: Selected references. Volume 9.		151
Biological changes resulting from drilling fluid disposal in the Canadian Arctic.		152
Past oil spill recovery of Arctic vegetation.		153
Terrain - vehicle interaction - Keewatin		154
Temperature effects of crude oil on polar bears.		155
Bowhead whale sightings in the Central and Eastern Canadian Arctic.		156
Haematological and petroleum residue studies of experimental polar bears.		157
BIOS - Baffin Island Oil Spill		158
Histopathology and haematology of experimental polar bears.		159

INFORMATION SURVEY - KINDS AND SOURCES - FOR THE
ENVIRONMENTAL ASSESSMENT AND REVIEW PROCESS:
BEAUFORT SEA HYDROCARBON PRODUCTION AND TRANSPORTATION PROPOSAL.

SECTION I: INFORMATION SOURCES

- I.1 Published Report List
- I.2 Index to Agency Information Sheets
- I.3 Agency Information Sheets

I.1 PUBLISHED REPORT LIST

The Following reports provide either a guide to the general type of information available from identified sources or provides detailed project listings which supplement those included in section II of this report.

1. 1979-1980 Government Activities in the North.

Advisory Committee on Northern Development document No. 532. Publishing Division, Dept. Indian Affairs and Northern Development, Ottawa, Ontario. 200 pp.

Abstract: This publication reports annually on government activities in the Yukon and Northwest Territories. Federal departments, agencies, crown corporations, and both territorial governments outline northern responsibilities, review past year's activities and project plans for the next fiscal year.

2. Guide to Marine Transportation Information sources in Canada. 1980. Transportation Development Centre, Transport Canada, Report No. TP2431, Montreal, Quebec, 221 pp.

Authors: Margaret C. Mackay and Ann L. Poole.

Abstract: (Authors)

An annotated directory has been developed to provide information on available data and bibliographic/statistical services which identify Canadian marine transportation information sources. The GUIDE includes 150 non-bibliographic sources of information such as corporate expertise within governments, universities, associations and commercial bodies. Primary sources were used to extract information on active agencies in the marine field. These bodies were then profiled. Seventy-nine secondary bibliographic sources with significant Canadian content such as data bases, directories, abstracts, indices, bibliographies, research in progress, periodicals, handbooks, etc. were identified. A detailed index follows the organizations profiles and bibliographic entries.

3. Current and Recent Research and Studies Relating to Northern Social Concerns. Vol. IV, part I, 1980-81. NSRD 81-1. Northern Affairs Program Department of Indian Affairs and Northern Development, Ottawa, Ontario. 323 pp.

Compiled by: Gertrude Rosenberg, Rachelle Castonguay and Jeffry Ross.

Abstract: This volume lists research projects undertaken during 1980-81 which relate to northern social concerns. Information provided includes title, location, purpose, methodology, findings, government department, researchers, reports and publications and contact. Reports have been issued since 1976.

Some of the projects most directly related to the review of the Beaufort Sea Hydrocarbon Production Proposal have been included in this report or covered by responses to the survey. However, the reader is referred to this document as a supplementary source of project listings.

I.2 INDEX TO AGENCY INFORMATION SHEETS

Category

Agency Information Sheet Title

File No.
(Report page no.)

Associations

Beaufort Sea Advisory Committee A-1

Arctic Petroleum Operators Association A-2

Commercial

Woodward - Clyde Consultants C-1

D.F. Dickins Associates Ltd. C-2

CanOcean Resources Ltd. C-3

E.R. Walker C-4

Pallister Resource Management Ltd. C-5

Acres Consulting Services Ltd. C-6

Artec Canada Ltd. C-7

Acres Santa-Fe Incorporated C-8

Interdisciplinary Systems Ltd. C-9

Beaufort Environmental Support Services
Ltd. C-10

MacLaren Plansearch C-11

Dome Petroleum Ltd. C-12

Educational Bodies

University of Ottawa, Dept. Geography Ed-1

Memorial University, Ocean Engineering Group Ed-2

C-CORE (Centre for Cold Ocean Resources
Engineering Ed-3

Ocean Engineering Information Centre (OEIC)	Ed-4
Arctic Institute of North America	Ed-5
Boreal Institute of Northern Studies	Ed-6
Arctic Science and Technology Information System	Ed-7
<u>Government</u>	
<u>Govt 1: Bedford Institute of Oceanography</u>	G1-1
<u>Govt 2: Energy, Mines & Resources Canada</u>	
Earth Physics Branch, Division of Seismology and Geothermal Studies (<u>Seismology Studies</u>)	G2-1
Geological Survey of Canada, Resource Geophysics and Geochemistry Division	G2-2
Earth Physics Branch, Division of Seismology and Geothermal Studies (<u>Geothermal Service</u>)	G2-3
Canada Centre for Remote Sensing	G2-4
Geological Survey of Canada, Atlantic Geoscience Centre	G2-5
<u>Govt 3: Employment and Immigration Canada</u>	G3-1
<u>Govt 4: Environment Canada</u>	
Lands Directorate, Land Resource and Data Systems Branch	G4-1
Atmospheric Environment Service, Ice Branch	G4-2
Atmospheric Environment Service, Western Region	G4-3
Atmospheric Environment Service, Meteorological Services Research Branch	G4-4

Northern Hydrology Service, Surface Water Division	G4-5
Canadian Wildlife Service - Seabird Research Unit, Migratory Birds Branch, Atlantic Region	G4-6
Environmental Protection Service, Yukon	G4-7
Atmospheric Environment Service - Central Region	G4-8
Atmospheric Environment Service - Arctic Meteorology Section, Applications and Impact Division	G4-9
Parks Canada, National Parks Branch	G4-10
Northern Technology Unit, Water Pollution Central Directorate	G4-11
Canadian Wildlife Service - Western and Northern Region	G4-12
Environmental Emergency Branch	G4-13
Environmental Protection Service, NWT	G4-14
Federal Environmental Assessment Review Office	G4-15
<u>Govt 5: Fisheries and Oceans Canada</u>	
Economic Policy & Marketing	G5-1
Arctic Biological Station	G5-2
Scientific Information and Publications Branch	G5-3
Marine Environmental Data Services Branch	G5-4
Ocean Science and Survey - Atlantic Oceanographic Laboratory	G5-5
Ocean Science and Surveys - Marine Ecology Laboratory	G5-6

Fisheries and Oceans - Western	G5-7
Ocean Science and Surveys, Central Research and Development Division	G5-8
Oceanographic Information Division, Institute of Ocean sciences	G5-9
Canadian Hydrographic Service, Atlantic Region	G5-10
<u>Govt 6: Indian Affairs and Northern Development Canada</u>	
Northern Affairs Program, Inuvik Office	G6-1
Northern Research Information and Documentation Service, Northern Social Research Division	G6-2
Northern Environmental Protection Branch, Northern Environment Directorate	G6-3
Office of Native Claims, NWT and Labrador Group	G6-4
Program Services, Indian and Inuit Affairs Program	G6-5
Library Services, Information Resources Division, Finance and Professional Services Program	G6-6
Major Projects Assessment Branch, Northern Affairs Program	G6-7
Northern Statistical Information Centre, Data Management Division, Northern Affairs Program	G6-8
<u>Govt 7: National Research Council</u>	G7-1
<u>Govt 8: Northern Canada Power Commission</u>	G8-1
<u>Govt 9: Public Works Canada</u>	G9-1

1.3 AGENCY INFORMATION SHEETS

Associations

Commercial Enterprises

Educational Bodies

Government

Compilation of material received in response to the

Information survey - Kinds and Sources - for the Environmental
Assessment and Review Process: Beaufort Sea Hydrocarbon
Production and Transportation Proposal.

Reference to Project Information Sheets submitted by the Agency is
given by the Project Information Sheet Numbers (P.I.S. No.).

Agency: BEAUFORT SEA COMMUNITY ADVISORY COMMITTEE
P.O. Box 1070
Inuvik, NWT X0E 0T0

Contact: Susie Huskey, chairperson
Dick Hill, coordinator
Telephone (403) 979-2656 or (403) 979-2260
Telex 034-44521

Objectives: The responsibilities of the Committee are to provide a two way information and liaison between local residents and the petroleum exploration industry in the Beaufort Sea area mainly in the areas of social, economic and environmental activities including-

- a. Information to communities
- b. Information to industry
- c. Northerner employment
- d. Local business involvement
- e. Environmental protection
- f. Special projects

Areas of Expertise: Resident involvement, wildlife studies, sea ice studies, local employment, local business involvement, community relations.

Current Projects: The BSCAC holds 4 scheduled meetings each year and special meetings as required. Two information visits to all the Beaufort communities with public meetings are held each year. In addition special committees and BSCAC members participate in research and study projects. Study tours are taken to observe offshore development activities in other areas. A Northern Information Service provides media clippings and CBC verbatims to community leaders and interested residents.

Information Services: The BSCAC operates an information file on Beaufort Activities and has access to the northern technical libraries of Arctech Services and DINA's Inuvik Research Laboratory.

Publications: The BSCAC publishes minutes of its meetings and summaries of Beaufort Sea activities and projects of interest to the Beaufort communities.

Agency: ARCTIC PETROLEUM OPERATORS ASSOCIATION (APOA)
APOA Information Service, P.O. Box 1281, Station M,
Calgary, Alberta T2P 2L2

Contact: J. Pallister Telephone: 403-264-3757

Objectives: The APOA is a non-profit association of around 30 oil companies active in Canada's Arctic. It provides a means of undertaking joint research projects relative to operating in the Arctic environment, encourage protection of the Northern environment, provide liaison with other groups interested in the Arctic and share information.

Area of Expertise: Over 100 projects have been completed on a wide variety of subjects such as problems resulting from the presence of sea-ice and accidental oil spills.

Current Projects: Large Scale Ice Stretch Tests
Aerial Re-connaissance of Ice - Beaufort Sea
Ice Mechanics and Ice Strengthening - Resolute Bay
Open Water Burning of Oil
See Project Information Sheet 27

As well, there have been studies of specialized vehicles for use in the Arctic, ecological studies, and general research and information projects. Among the latter has been support of the Arctic Institute of North America for its Beaufort Sea Symposium and an Arctic Science and Technology Information System.

Information Services: APOA reports can be obtained from the address listed above. Lists of reports appear in the APOA Review. The Arctic Science and Technology Information System (ASTIS) has recently prepared a bibliography of APOA Research Projects. Abstracts are provided for all documents in the APOA bibliography. It is 74 pages and includes detailed title, author, subject, and geographical indexes. It costs \$10.00 pre-paid and is available through APOA Information Service or from ASTIS.

Publications: The APOA Review - 3 times a year
"Undertaking the Beaufort Sea" - 30 min. film
Description of Research Projects A handbook, 905 pp.
microfiche \$24.00

Agency: WOODWARD-CLYDE CONSULTANTS
16 Bastion Square
Victoria, B.C. V8W 1H9

Contact: Dr. Edward H. Owens Telephone: 604-381-5811

Objectives: Environmental consulting company that provides services related to geology, biology, oceanography, oil spills, and coastal processes in Arctic environments.

Areas of Expertise: Since 1967 our staff have conducted coastal environmental studies in the Canadian Arctic. We have conducted field work in the Beaufort Sea region and through all the Northwest Passage including Lancaster Sound and Northeast Baffin Island. In addition, since 1974 our staff have conducted numerous field studies on the Alaskan Beaufort Sea coast. Recently we have conducted oil spill countermeasure and contingency planning studies and EIS work for Dome Petroleum. As part of our spill related services to Dome we have conducted low-altitude colour videotape surveys of the entire Northwest Passage between the U.S. border and Baffin Bay.

Specific Projects: Specific Projects include: (Project Information Sheets 81-92)
EAMES Atlas Workshop
AMOP Oil Spill Site Selection
APOA Oil Spill Training Workshop
Arctic Shoreline Analysis
Beaufort Sea Coastal Bibliography
Coastal Mapping Sverdrup Lowlands
Beaufort Sea Video Survey
Northwest Passage Video Survey
Baffin Island Oil Spill Experiment
Parks Canada Natural Region #26 Analysis
Parks Canada Regional Analysis Western Archipelago
Northern Transportation EIS
Amundsen Gulf Video Survey
Geotechnical Aspects of Artificial Islands
Seismicity and Seismic Review for Artificial Islands

Information Services: In addition to extensive personal libraries we have a (proprietary) set of tapes that cover the entire shoreline of the Northwest Passage at low altitudes.

Publications: The majority of the reports that have resulted from the projects cited above are either proprietary or confidential. A selection of recent reports and publications by Dr. Owens follows:

Reports:

Owens, E.H., Pacific Coast Spill Response Manual-- Pilot Study: Esquimalt to Bamfield; unpublished report to Environmental Protection Service, Environment Canada, North Vancouver, B.C.

Owens, E.H., 1980. Coastal Environments and the Cleanup of Oil Spills for Inland Waters: unpublished report to Environmental Protection Service, Environment Canada, Toronto, 33 p.

Owens, E.H., 1980. Physical Shore-Zone Analysis, Saltspring Island, B.C., unpublished report to Lands Directorate, Pacific and Yukon Region, Environment Canada, Vancouver, 155 p.

Owens, E.H., 1979. Shoreline Analysis of Alaska and Arctic Canada for the Beaufort Sea Preliminary Environmental Assessment Cycle; report for Dome Petroleum to Arctic Sciences Ltd., Sidney, B.C., 72 p. and maps.

Owens, E.H., 1979. Selection of Sites for AMOP Baffin Island Nearshore and Shoreline Oil Spill Experiment; report to Environmental Protection Service, Environment Canada, Edmonton, Alberta 39 p.

Owens, E.H., 1979. An experimental design for field testing of arctic shoreline cleanup techniques on the Labrador coast- Phase I; Environmental Protection Service, Environment Canada, Edmonton, Alberta, (AMOP Programme), 79 p.

Owens, E.H., 1977. Coastal environments of Canada: The impact and cleanup of oil spills; Fisheries and Environment Canada, Environmental Impact Control Directorate, Ottawa, Econ. and Tech. Review Rept. EPS-3-EC-77-13, 413 p.

Owens, E.H., 1980. Physical Shore-Zone Analysis, Saltspring Island, B.C., unpublished report to Lands Directorate, Pacific and Yukon Region, Environment Canada, Vancouver, 155 p.

Owens, E.H., 1979. Shoreline Analysis of Alaska and Arctic Canada for the Beaufort Sea Preliminary Environmental Assessment Cycle; report for Dome Petroleum to Arctic Sciences Ltd., Sidney, B.C., 72 p. and maps.

Owens, E.H., 1979. Selection of Sites for AMOP Baffin Island Nearshore and Shoreline Oil Spill Experiment; report to

Environmental Protection Service, Environment Canada,
Edmonton, Alberta 39 p.

Owens, E.H., 1979. An experimental design for field testing of arctic shoreline cleanup techniques on the Labrador coast- Phase I; Environmental Protection Service, Environment Canada, Edmonton, Alberta, (AMOP Programme), 79 p.

Owens, E.H., 1977. Coastal environments of Canada: The impact and cleanup of oil spills; Fisheries and Environment Canada, Environmental Impact Control Directorate, Ottawa, Econ. and Tech. Review Rept. EPS-3-EC-77-13, 413 p.

Papers:

Robilliard, G.A., and Owens, E.H., 1981. An integrated biological and physical shoreline mapping system applied to oil spill countermeasures; Proc. 4th Arctic Marine Oil Spill Programme Tech. Seminar, Edmonton, June 1981; Environmental Protection Service, Environment Canada (in press).

Owens, E.H., Taylor, R.B., Miles, M., and Forbes, D., 1981. Coastal geology mapping: an example from the Sverdrup Basin, N.W.T.; Geol. Surv. of Canada, Current Research (in press).

Owens, E.H., 1981. The impact and cleanup of oil on coastlines; Proc. Offshore Env. in the 80's, St. John's, Newfoundland (in press).

Owens, E.H., and Robilliard, G.A., 1981. Shoreline sensitivity and oil spills--a reevaluation for the 80's; Marine Poll. Bull., 12(3), p. 75-78.

Owens, E.H., and Robilliard, G.A., 1980. Shoreline aerial videotape surveys for spill countermeasures; Spill Tech. Newsletter, Environmental Protection Service, Environment Canada, Ottawa, 5(5), p. 126-130.

Robilliard, G.A., Owens, E.H., Castle R., and Foget, C. 1980. Arctic shoreline protection and/or cleanup - how to decide what to do, when, and where; Proceedings of the Third Arctic Marine Oil Spill Programme Technical Seminar, Edmonton, June 1980, Environmental Protection Service, Environment Canada, p. 242-278.

Owens, E.H., Harper, J.R., and Nummedal, D., 1980. Sediment transport systems and coastal variability along the Alaskan

North Slope; Proc. 17th International Coastal Engineering Conference, Sydney, Australia, March 1980 (Amer. Soc. Civil Engineers, N.Y.) (in press).

Owens, E.H., 1980. Coastal environments of Canada: In (A.J. Bowen, ed.) Basic Nearshore Processes--Short Course Lecture Notes. Nat. Res. Council, Ottawa, p. 1.1-1.29.

Owens, E.H., 1979. Field testing of arctic shoreline cleanup techniques on the Labrador coast - Phase I; Proceedings Arctic Marine Oil Spill Program Technical Seminar; Edmonton, June 1979, Environment Canada, Environmental Protection Service, p. 287-293.

Harper, J.R., Owens, E.H., and Wiseman, W.J., Jr., 1978. Arctic beach processes and the thaw of ice-bonded sediments in the littoral zone; 3rd International Permafrost Conf., July 1978, National Research Council of Canada, Ottawa,

Owens, E.H., 1979. Field testing of arctic shoreline cleanup techniques on the Labrador coast - Phase I; Proceedings Arctic Marine Oil Spill Program Technical Seminar; Edmonton, June 1979, Environment Canada, Environmental Protection Service, p. 287-293.

Harper, J.R., Owens, E.H., and Wiseman, W.J., Jr., 1978. Arctic beach processes and the thaw of ice-bonded sediments in the littoral zone; 3rd International Permafrost Conf., July 1978, National Research Council of Canada, Ottawa, Vol.1, p. 195-199.

Agency: D.F. DICKINS ASSOCIATES LTD.
3732 West Broadway
Vancouver, B.C. V6R 2C1

Contact: D.F. Dickens Telephone: 604-224-4124

Objectives: Consulting Services.

Areas of Arctic Environmental Impact Assessment
Expertise: Arctic Oil Spill Countermeasures with particular emphasis on oil/ice interaction
Sea Ice Dynamics including:
- formation processes
- historical trends
- movement
- surface roughness (ridging, pile-ups)
- conditions along specific shipping routes
Arctic Transportation including Air Cushion Vehicles

Projects: Current Relevant Projects:
- Long Term Fate and Effects of Oil Spilled at Balaena Bay in 1974/75 - ongoing for Gulf Canada (P.I.S. 43)
- Tanker Route Ice Conditions - Beaufort Sea Production E.I.S. - for Dome Petroelum Ltd. (P.I.S. 44)

Recent Projects (1979-80)
Study of Ice Conditions in Navigational Channels, Viscount Melville Sound to the Southern Beaufort, Sea, November 1978. Proprietary to Dome Petroleum Ltd.

Shorefast Ice Conditions, Canadian and Alaskan Beaufort Sea, December 1978. Proprietary to Canadian Marine Drilling Ltd., Calgary.

Eastern Arctic Blowout Scenarios, January 1979. Report to James F. MacLaren Ltd. for inclusion in A Major Oil blowout Contingency Plan for the Eastern Arctic.

Study of Ice Conditions Along a Year Round Shipping Route from the Bering Strait to the Canadian Beaufort Sea, June 1979. Proprietary to Canadian Marine Drilling Ltd., Calgary. (P.I.S. 47)

Air Deployable Oil Spill Igniter Tests, Yellowknife, May 1979. Report for Canadian Marine Drilling Ltd. and the A.P.O.A. (P.I.S. 45)

Review of State of the Art Air Cushion Vehicle Capabilities in Support of Oil Spill Clean-up Operations in the Alaskan Beaufort Sea, September 1979. Proprietary to Shell Oil Company, Houston.

Evaluation of a Year-Round Shipping Route to Melville Island Through Fury and Hecla Strait, October 1979. Proprietary to Petro Canada, Calgary.

Scientific Co-ordination - Oil and Gas Under Beaufort Sea Ice Study, October 1979 to December 1980. For Canadian Marine Drilling Ltd. (P.I.S. 46)

Information
Services:

Maintain company library of government and consultants' reports on subjects listed in area of expertise. Much material is unpublished and proprietary in nature. Limited access is possible through D. Dickins.

Publications:

General publications:
- Northern Project Experience

Agency: CANOCEAN RESOURCES LTD.,
610 Derwent Way
New Westminster, British Columbia V3M 5P8

Contact: Mr. John G. English, P.Eng., Telephone: 604-524-4451
Manager of Communications and Sales Coordination.

Objectives: CanOcean Resources Ltd. is a diversified international hydrocarbon technology company specializing in the development of energy resources, onshore and offshore.

CanOceans's services include:

- Applied Research and Development
- Hardware and Plant Fabrication
- Wet or Dry Subsea Installation
- Wet or Dry Well Completion
- Arctic Production Systems
- Systems Maintenance
- Advisory/Consulting Services
- LNG Systems
- Contract Engineering and Project Management

As a Canadian company, CanOcean is dedicated to the development of hydrocarbon potential in Canada's frontier areas in a manner which utilizes optimum production techniques and protects the Canadian environment.

CanOcean is involved in, and interested in, the following aspects of Beaufort Sea production:

- a) evaluation of alternative production scenarios;
- b) research and development and prototype testing of new technology related to Arctic development;
- c) supply of subsea hardware related to oil or gas production;
- d) subsea and shore transportation systems - pipelines and LNG.

CanOcean has completed several projects directly related to development of the Beaufort Sea. By working jointly with oil companies and government agencies, CanOcean has developed expertise in the problems and considerations of Beaufort Sea production.

Areas of Expertise: a) Field Development Feasibility Studies
- evaluation of the technical environmental and social aspects of alternate production scenarios;

- b) Subsea Completions and Production Systems
 - experience gained in installations in the North Sea, Gulf of Mexico, and offshore Brazil in subsea completion systems;
- c) Arctic Environmental Conditions
 - knowledge gained from previous studies and ongoing work on the Arctic Pilot Project and with NORDCO, C-CORE, and DOME:
- d) Pipeline Installations
 - subsea and surface installation techniques;
- e) Design, Fabrication and Testing of Prototype Equipment;
- f) Project Management
 - of studies, R & D programs, hardware supply, marine installations.

Projects:

Following is a list of projects recently completed or presently under-way, which are directly related to the Beaufort area or the Canadian Arctic:

- a) Frontier Subsea Production Pilot Project
 - Beaufort Sea production feasibility study;
- b) Arctic Pilot Project
 - Arctic pipelines and LNG transport;
- c) Extended Well Production
 - part of Dome's Beaufort production scheme;
- d) Oil Spill Containment Study
 - Arctic, under-ice;
- e) Subsea Containment
 - general

See Project Information Sheets 68-74

Information Services:

CanOcean maintains a comprehensive technical library of material related to offshore hydrocarbon development.

In addition, the following library search systems are utilized constantly by the CanOcean librarian:

- DIALOG, SDC-ORBIT, CAN-OLE, Q-L Systems

Information generated internally is generally proprietary and available only to customers. Requests for information should be directed to the Communications and Sales Coordination office.

Publications:

CanOcean does not issue any general publications on a regular basis.
Reprints of technical papers are available on request.

Agency: E.R. WALKER
3350 Woodburn Avenue
Victoria, B.C. V8P 5C1

Contact: E.R. Walker Telephone: 604-542-9184

Objectives: Professionally retired. Available for limited consultation and information review.

Areas of Expertise: Oceanography and meteorology.

Information Services: Local and personal

Publications: Walker, Edward R. and Peter Wadham, 1978. Thick sea-ice floes. Arctic 32 (2): 140-147.

Walker, Edward R. 1977. Aspects of oceanography in the Archipelago. Institute of Ocean Sciences - Victoria, B.C.

Walker, Edward R. 1975. Oil, ice and climate in the Beaufort Sea. Beaufort Sea Project Technical Report No. 35. Department Environment. Victoria, B.C.

Agency: PALLISTER RESOURCE MANAGEMENT LTD.
700 - 6th Avenue S.W.
Calgary, Alberta T2P 0T8

Contact: Mr. Jeff Pallister Telephone: 403-263-3110
Telex: 03-82442/Kenting Ltd. CGY

Objectives: To provide consulting services in the areas of oil and gas exploration, development and transportation, ice engineering, including subsea activities.

Areas of Expertise: Research and development for ocean engineering, oil and gas offshore exploration equipment. A study of the marine service industry. Pallister Resource Management produces under contract the APOA Review for the Arctic Petroleum Operators Association.

Information Services: Pallister has a technical library of approximately 3000 documents. About 10-25% are marine related. The library dates from 1973 and includes technical reports, computerized literature searches, etc. Access for researchers who establish a need-to-know.

Current Projects: Recent projects (selected) and major activity area:

Beaufort Sea Environmental Program (Environment)
Oil and Gas Offshore Equipment (Ocean Engineering)
Research and Development for Ocean Engineering (Resource Development)
Government Policy (Resource Development)
Potential Oil and Gas Supplies (Resource Development)
Summarization of Petroleum Industry Arctic (Resource Development)
Study of Marine Service Industry (Ocean Engineering)

Agency: ACRES CONSULTING SERVICES LIMITED
8th Floor, 800 West Pender Street
Vancouver, B.C. V6C 2V6

Contact: Dr. S. Brown Telephone: 604-683-9141
Manager of Environmental, Economic and Planning Studies

Objectives: Acres is a major international consulting organization offering a diversity of services to government, industry and commerce. The Company provides a comprehensive range of services using strict quality control procedures and employing the most up-to-date methodology and equipment.

Area of Expertise: Acres can offer the services of specialists in environmental assessment, social and economic evaluation and pollution control. Of particular significance is Acres experience in land use/planning, water/air quality control and ice modelling.

Current Projects: Oil and Gas Exploration Supply Base - Mackenzie Delta, NWT.
Site selection study for 200-man supply base. (Project Information Sheet 107)

Harbour Master Plan, Tuktoyaktuk, N.W.T.
Preparation of master plan to provide guidelines to achieve a balance between harbour development, the economic development resources of the region and the broader needs of the community. (Project Information Sheet 93)

Economic Development Plan - Town of Inuvik, N.W.T.
Provision of planning expertise to facilitate development of an overall comprehensive economic plan for the Town. (Project Information Sheet 106)

Information Services: Acres maintains an in-house library of books, journals and publications for daily use and reference. A full time data retrieval specialist is responsible for maintaining the library, acquiring new material and conducting literature and data searches for project staff.

Acres also has access to international, American and Canadian data bases through an on-line remote terminal computer search system. As an international company, Acres has offices in 15 cities in Canada and in the U.S. as well as several permanent and project offices overseas.

Publications: Brochures for further information on company resources and experience including (consulting services, Representative Personnel and Selected Project Descriptions.)

- (a) Environmental Services
- (b) Economic Studies and Planning

Agency: ARCTEC CANADA LIMITED
311 Leggett Drive
Kanata, Ontario K2K 1Z8

16 - 6325 - 11th Street S.E.
Calgary, Alberta T2H 2L6

Contact: Mr. I.F. Glen Telephone: 613-592-2830
Senior Vice President

Objectives: Research and Development in Arctic Marine Technology, Ice Engineering, Environmental Studies and Studies associated with the Development of Engineering Concepts for the Arctic.

Area of Expertise: Analytical modelling of ice forces on structures and ships, ice movement, route analysis, risk analysis;

Physical modelling of ice interactions with ships and structures using unique laboratory facilities.

Field tests to measure ice properties and performance of vessels and structures in ice, including oil spill projectories, ice loads and pressures, vehicle motions, etc.

Current Projects: Most of Arctec's projects are associated with R & D in the Arctic Environments. The following is a selection of representative current or recent projects and/or proposals:

- Oil Spill Clean up
- Northwest Passage Ship Transit Study
- Ice tests in Offshore Platforms
- Consultation on Ice Ride Up
- Modelling of Ice Forces on Structures
- Structural Design Requirements for Arctic Vessels
- Ice Forces on Islands - Grand Banks
- Circular Drill Barge Test
- Arctic Super Dredge
- Melville Sound Ice Survey
- Drill Barge
- A.P.P. Aerial Survey
- Moored Drillship Tests
- Design Requirements for Vessels in Ice
- Oil Well Permafrost Simulation
- Sea Ice Field Studies, Nfld.
- Iceberg Review
- N.W. Passage Environment
- Baffin Bay Ice Study
- Ice Pressure Criteria

- Ice Ridge Damage Paper
- Moored Drillship Simulations
- Arctic Petro Production and Trans Risks
- Snow Friction Studies
- Arctic Breaker Structure

Information
Services:

In-house library of over 8,000 Arctic related documents;
500 Internal Reports; access to computer terminals to
recognized technical data bases.

Publications:

Reports generally of a proprietary nature; quarterly
newsletter known as "Ice News".

Agency: ACRES-SANTA FE INCORPORATED
Suite 450, 6712 Fisher Street S.E.
Calgary, Alberta T2H 2A7

Contact: Dr. A.B. (Gus) Cammaert Telephone: 403-253-9161

Objectives: To provide engineering and management services for Canadian offshore oil and gas developments.

Area of Expertise: Marine Engineering
Civil and Structural Engineering
Geotechnical Engineering
Petroleum Production Engineering
Environmental Service
Arctic Engineering
Project Support Services

Current Projects: See Project Information Sheets 93-113 for additional detail
Biological Studies
- Effects of Warm Water Discharge on Marine Life in Bridport Inlet, Melville Island.
- Heavy Metals Marine Contamination Study.
- Study of Alleviating Adverse Effects of Contaminated Bottom Sediments.
- Study of Management of Northern Grizzly Bear Populations.

Physical Studies and Projects

- a) Physical Environment
- Laboratory Experiments of Oil and Gas Movement under Simulated Arctic Conditions.
 - Environmental Assessment for Marine Terminal.
 - Laboratory Study of Heat Transfer at Ice/Water Interface.
- b) Planning and Feasibility Studies
- Tanker Terminal Feasibility Study for Petro Chemical Complex.
 - Feasibility Study, Deepwater Transshipment Storage Facility.
 - Risk Analysis for Pipeline Construction.
 - Tuktoyaktuk Harbour Master Plan.
 - Arctic Marine Terminal Module Feasibility Study.
 - Study of Offshore Oil and Gas Production Facilities, Labrador Sea.
 - Semi-submersible Evaluation Studies.
 - Caisson Construction for Beaufort Sea, Scheduling and Risk Analysis.
 - McKinely Bay Mooring Basin, Development Study.
 - Risk/Reliability Analysis for LNG Facilities, Melville Island.

- c) Transportation Studies
 - Ice Navigation Study, Field Observations and Model Study.
 - Transportation of Gas and Oil from the Arctic Islands.
- d) Ice and Permafrost Studies
 - Ice Management for Arctic LNG Terminal.
 - Compilation of Ice Forces Against Structures.
 - Ice Studies for Exploratory Drilling System.
 - Impact of Warm Water Discharge on Subsea Permafrost.
 - Permafrost Effects on Well Casing Design in Beaufort Sea.
 - Settlement of Well Clusters on Artificial Islands in Beaufort Sea.
 - Crossing of Ship Tracks in Barrow Strait.
 - Stress Analysis of Barrow Strait Ice Cover.
- e) Design and Construction Management Services
 - Production and Gathering System, Design and Project Management.
 - engineering and Construction of Urea Loading Facility.
 - Project Management for Thistle Oil Field.

Social Studies

- Assessment of Tourism Impact on MacKenzie Valley Communities.
- Technological Opportunities in the Canadian North.

Information
Services:

Company libraries (Acres and Santa Fe)
On-line data banks

Agency: INTERDISCIPLINARY SYSTEMS LTD. (IDS)
I.D. ENGINEERING COMPANY (IDE)
966 Waverly Street
Winnipeg, Manitoba
R3T 4M5

IDS and IDE are affiliated companies with common ownership. In addition to Winnipeg, we have offices in Vancouver, Calgary, Edmonton, Lloydminster, Saskatoon and Grand Forks (North Dakota).

Contact: Dr. K.M. Adam, President Telephone: 204-453-3745
Interdisciplinary Systems Ltd.

Objectives: We have an ongoing interest in ensuring that environmentally sound, socially responsible, and technically feasible production processes are developed if hydrocarbon extraction proceeds.

Areas of Expertise: We have on staff a complete range of biologists, socio-economists, engineers and technical support staff. Many have been involved in our previous field and office studies of hearings and participation in the Mackenzie Valley, Alaska Highway and Dempster Highway pipeline proposals, the Arctic Pilot Project and the Melville Island gas gathering systems. In particular, we have specific expertise on permafrost, frost heave and drainage disruption, snow and ice engineering, wildlife biology and northern vegetation and reclamation, and assessing social, economic and cultural effects of development on local resources, resource use and residents.

Current Projects:

- Evaluation of the Hire North Program, 1973-78 (P.I.S. 119)
- Cumberland Lake Level Control Project Environmental Impact Statement. (P.I.S. 121)
- Socio-Economic Impact Assessment of the Arctic Pilot Project on High Arctic Communities (P.I.S. 120)
- Socio-Economic Impact Assessment of Grand Rapids Hydroelectric Project on Four Indian Bands of Swampy Cree-Tribal Council (P.I.S. 122)
- Ice Aggregate Roads (P.I.S. 123)
- Regulatory and Manpower Planning (P.I.S. 125)
- Candidate Natural Areas of Canadian Significance (P.I.S. 124)

In addition to these current projects, we have conducted numerous relevant studies in the past. Many have been made public or used at regulatory hearings including the

Mackenzie Valley Pipeline Inquiry (Berger), Alaska Highway Pipeline Inquiry, (Lysyk, Bohmer, Phelps), the N.E.B. and EARP Panels (Alaska Highway, Arctic Pilot Project). Some of these are listed below.

Information Services:

As a result of our previous work on northern development related studies, our library contains extensive relevant reference material. Material not being used on current projects can be made available on an interlibrary loan basis.

Publications: General Public Information and Awareness

Environment Protection Board Gas Pipeline Newsletter:
1971-1975 - 28 issues

"What about..." series of brochures: 1971-1974 - 8 foldout brochures (environment, caribou, fish, birds, permafrost, vegetation, vegetation damage and recovery, environmental impacts)

"Getting Along in..." series of booklets for Petro-Canada: 1977-80 - 3 booklets: Arctic Islands, Mackenzie Delta, Labrador.

Arctic Pilot Project public information booklets (in English and Inuktitut):

- What We Are Saying in Our Application - 1978
- Social and Economic Policies - 1980

Past Technical Reports

Towards an environmental impact assessment of the portion of the Mackenzie Gas Pipeline from Alaska to Alberta: 3 Interim Reports, with technical appendices (1971-1973).

Environmental impact assessment of the portion of the Mackenzie gas pipeline from Alaska to Alberta: 4 volumes (1974)

Initial Environmental evaluation of the proposed Alaska Highway gas pipeline, Yukon Territory (1977)

The transmission of Prudhoe Bay gas to American markets: a preliminary environmental comparison of the Canadian Arctic Gas pipeline and the Foothills (Yukon) pipeline in the Yukon and Northwest Territories (1977)

Environmental and Socio-economic code for the Yukon portion of the Alaska Highway gas pipeline (1978)

Initial impact assessment, Dempster Corridor - Physical and biological environmental (1978)

Assessment of the socio-economic impacts of the Arctic Pilot Project on selected high Arctic communities (1978, updated 1980).

A comprehensive study of past and potential land use in area "A", proposed Tuktoyaktuk land freeze. (1977)

Effects of exploration and developments in the Baker Lake area (1978)

Panarctic gas gathering system environmental impact statement (1979)

Evaluation of the Arctic Land Use Research Program (ALUR) (1979)

Agency: BEAUFORT ENVIRONMENTAL SUPPORT SERVICES LTD.
P.O. Box 30
Tuktoyaktuk
N.W.T. XOE 1C0

Contact: Don J. MacWatt Telephone: 403-978-2215
403-977-2331

Objectives: Support services in areas such as oilspill response and development, solid waste management and logistical support for field studies.

Areas of Expertise: First hand knowledge of MacKenzie Delta, Yukon Coast, Tuk Peninsula and Western Arctic Communities.

Conversant with traditional land uses and lifestyle, present day utilization and relevance, and future expectations.

Development of a local oilspill response team.

Design and construction of logistical support equipment.

Current Projects: Participated in the following environmental studies:

- Solid Waste Management in the Beaufort
- Travel on Ice by Local Hunters
- Oil and Gas under Ice Experiment
- Support of Fish and Whale Monitoring Studies
- Importance of Traditional Lifestyle

Agency: MACLAREN PLANSEARCH LTD.
Windmill Place, 1000 Windmill Road
Dartmouth, N.W. B3B 1L7

Contact: Shirley A.M. Conovev Telephone: 902-469-0932
Vice President

Objectives: Consulting Service

Areas of Expertise: Computer Sciences; Economic and Social Studies Environmental Sciences; Ocean Sciences and Operations; Transportation Studies: Urban and Regional Planning; Water Resources.

Current Projects: Ice Surveillance on the Dome drill rigs (proprietary to Dome)

Arctic Risk Study for the Environmental Protection Service: Participation with FENCO in an analysis associated with transport of oil from sites in the Beaufort and elsewhere in the Arctic to southern ports. In addition to developing risk estimates for the transporting vehicles, assessment of impacts on the biological resources and recommendations for future studies are being made.

Agency: BEAUFORT SEA PRODUCTION AND DEVELOPMENT DIVISION
Dome Petroleum Ltd.
Place 800
800 - 6th Avenue
Calgary, Alberta T2P 0N1

Contact: R.A.W. Hoos Telephone: 403-266-7838
Assistant Manager
Environmental Impact Assessment

Objectives: Research and development programs in support of the offshore exploration drilling and anticipated Development and production program in the Canadian Beaufort Sea. "Research" projects are those undertaken to advance existing technology to develop Dome's Arctic marine exploration capabilities; while "operation" projects are ongoing projects to support drilling and related operations.

The scope of the Research & Development projects can be categorized as follows:

- Environmental Design Criteria
- Environmental Impact Assessment
- Oil Spill Research and Oil Spill Operations
- Environmental Monitoring
- Drilling and Production System Research, Design and Development.

General: Major projects between 1975-1980 included:

A. Research:

1. Shorefast Ice Drilling - most of the problems related to drilling with drillships in shorefast ice have been solved to the point allowing actual operation.
2. Late Season Drilling with Drillships in Seasonal Pack Ice
- The late season drilling program led to ship design modification and development of late season drilling operational procedures.
3. Pressure Ridge Ice Scour - Research programs on pressure ridge ice scour have been conducted for the past several years to gain an understanding of scour distribution patterns and maximum water depths at which ice scour protection is required.
4. Turrent Moored Icebreaking Drillship Feasibility Assessment - Analysis of the data and ice tank model tests have confirmed that an icebreaking drillship is both feasible and economical for year-round pack ice drilling in the

Beaufort Sea. The research and development that has been done to date has led to a final design for an off-centered, turret moored, icebreaking drillship.

5. Turret Moored Icebreaking Drillship Ice Hazard Early Warning System - The turret moored, icebreaking drillship was designed to operate year round in the moving pack ice of the Beaufort Sea. The drillship has been designed to disconnect and move off location if large, hazardous ice features threaten the vessel's safety.

Considerable work has been done by Dome in designing an adequate remote sensing system that can be used for operational, year-round drillship support. Similarly, research and development has taken place on a short term (one to two days) ice dynamics prediction model for operational support of the drillship. Remote sensing systems that have been researched and developed include airborne, subsea, derrick top and shipborne systems. The ice dynamics prediction model development included modifying and making operational the AIDJEX ice dynamics model.

6. Oil Spill Research - Research on all aspects of oil spill prevention, oil spill cleanup and environmental impacts of oil spill has been conducted by Dome Petroleum, other operators and the Canadian Government in the Canadian Beaufort Sea. Considerable research and development has been done on oil spill cleanup equipment and oil spill cleanup techniques specially adapted for ice-covered waters of the Arctic marine environment.

7. Ice Forecasting/Ice Prediction - For strategic planning of offshore drilling operations in the Beaufort Sea, it is desirable to have long term (six months to one year) ice forecasting capability to predict when such severe ice conditions may occur. Dome and the Canadian Government are jointly developing long term ice forecasting/ice prediction capabilities for the Beaufort Sea.

8. AML Seismic - Dome is currently investigating alternative methods for collecting seismic data in the ice-covered waters of the Canadian Arctic Archipelago and in the Continental Shelf areas lying under the polar pack ice.

9. Beaufort Sea Production System - Dome has been carrying out research and development programs on oil and gas from Beaufort Sea structures. The preliminary research studies included:

- tanker route feasibility studies for transporting hydrocarbons from the Beaufort Sea to southern markets;

- Beaufort Sea production environmental impact studies;
- oil spill contingency and counter measure studies for Beaufort Sea production;
- investigation of natural pingos for scale model production platform tests in moving pack ice

10. Kigoriak Research Program - The design construction and testing of Dome's innovative and experimental Arctic Class 4 icebreaker, the "Canmar Kigoriak", has substantially increased Dome's Arctic marine operational capabilities.

The Kigoriak research program was designed with two major objectives in mind:

1. to develop, test and improve icebreaker and icebreaking tanker/LNG Carrier design concepts for year-round Arctic marine operation, and
2. to develop, test and improve operating concepts for year-round Arctic marine activities (exploration drilling, production and transportation).

Because the Kigoriak has been able to navigate in almost all ice conditions throughout the winter, invaluable data for future icebreaker design, icebreaking tanker/LNG Carrier transit times, year-round Arctic marine operating techniques and year-round drilling and production platform design have been collected and analyzed.

B. Environmental Operations

1. Environmental Monitoring - Dome has conducted a Beaufort Sea Environmental Monitoring Program since 1976.

- a) Environmental Data Collection - To assist in accurate Beaufort Sea weather and ice movement predictions, meteorological, oceanographic and sea ice data have been collected at each drillsite during the operating season.
- b) Wildlife Observation - Collection of inventory and behavioral data on wildlife in the Beaufort Sea.

2. Oil Spill Operations - Dome maintains an extensive inventory of oil spill containment and clean-up equipment in the Beaufort Sea for containing and cleaning up potential oil spills in an Arctic marine environment. Oil spill containment and clean-up exercises are held on a regular basis. A crew of specialists is employed to maintain equipment, deploy equipment in emergencies, and manage any oil spills.

Current Research:

More specific information on ongoing or recent research projects is provided (Project Information Sheets) under the broad categories:

- Oil Spill Prevention/Clean-up/Impact Prediction - Current projects 1980-81.

- Ice Research 1980-1981
- Oceanographic Research 1980-1981
- Geotechnical Research 1980-1981
- Remote Sensing Program 1980-1981.

Recent:

- Oceanographic and Sea Ice Research (1979-1980)
- Oil Spill Research (1979-1980)
- Beaufort Sea Production Environmental Studies 1979-1980.
- Biological - Chemical Research Programs 1980.
- Research Program for Canmar Kigoriak

Information
Services:

Library and Information services are maintained for in-house use.

Publica-
tions:

Publications and reports may be released immediately, or may be held as proprietary information.

Agency: UNIVERSITY OF OTTAWA
DEPARTMENT OF GEOGRAPHY
Ottawa, K1N 6N5

Contact: Dr. H.M. French
Professor
Department of Geography 231-2471
Department of Geology 231-6829

Objectives: The study of permafrost related geomorphic processes,
Western Canadian Arctic.

Areas of Expertise: Geomorphology, permafrost and ground ice conditions, Banks
Island, and Mackenzie Delta.

Terrain disturbance studies associated with exploratory
wellsites, Arctic Canada (Arctic islands, Mackenzie Delta,
interior Yukon).

Waste drilling disposal problems and Territorial Land Use
Regulations.

Current Projects: (1) Coastal process studies, and sediment movement,
Southwest Banks Island (with Dr. M.J. Clark, University of
Southampton, U.K. and D.G. Harry, University of Ottawa,
Ph.D. student). (Project Information Sheet 58)
(2) Terrain, land use and waste drilling fluid disposal
problems adjacent to exploratory wellsites in permafrost,
Arctic Canada. (work undertaken with ALUR Program, IAND,
Ottawa, and APOA, Calgary, and individual companies).
(Project Information Sheet 57)

Information Services: University library

Publications: No general publications. Individual publications included
with project information.

Agency: MEMORIAL UNIVERSITY OF NEWFOUNDLAND
OCEAN ENGINEERING GROUP
Faculty of Engineering and Applied Science
St. John's, Nfld. A1B 3X5

Contact: G.R. Peters Telephone: 709-737-8805
Ocean Engineering Group Leader

Objectives: The Ocean Engineering Group was established in the Faculty of Engineering and Applied Science in 1969 and consists of members of the Faculty who concentrate their research efforts on ocean related problems. The principle concern of the Group is the development of the technology to implement resource utilization of an ice infested continental shelf.

Area of Expertise: Members, Ocean Engineering Group, and Interest or Research Area.

H.N. Ahuja	Management of Ocean Projects
D. Bajzak	Ice and Ocean Currents, Remote Sensing
M. Booton	Vibrations of Structures and Fluids
B. Bowen	Thermodynamics
M.P. Bruce-Lockhart	Electronics and Ocean Instrumentation
T.R. Chari	Marine Geotechnology and Iceberg Scour
R.T. Dempster	Fluid Dynamics, Icebergs, Ocean Engineering
D.A. Friis	Ocean Transportation, Shipbuilding
R.M. Hopkins	Ocean Corrosion
C.C. Hsiung	Naval Architecture, Hydrodynamics
J.D. Malcolm	Oilspills
W.J. Milne	Shipbuilding
J. Molgaard	Ice friction
D.B. Muggeridge	Ocean Structures, Fluids, Wave Tank
G.R. Peters	Ocean Engineering, Fisheries
D.V. Reddy	Structural Analysis, Ice Forces
P.N. Smith	Ice Properties, Materials
W.G. Smith	Mechanical Development
	Sea ice Movement and Ice
W.J. Vetter	Acoustical Sensing, Object Dynamics
J. Walsh	Ocean Communications
A. Zielinski	Telemetry and Instrumentation

Current
Projects:Ocean Geotechnology:

- Ocean Sediment Properties Using Acoustic Sensing
- Identification of Subsurface Layering by Acoustical and Signal Processing Techniques
- In-Situ Soil Tests Using Impact Penetrometer
- Geotechnical - Acoustical Correlations - Placentia Bay

Ocean Acoustics, Communication and Telemetry:

- Swept Carrier Underwater Acoustic Communication System
- Underwater Digital Telemetry System
- Doppler Acoustic Telemetry System for Free Fall Penetrometer
- Multichannel Acoustic Telemetry
- Shallow Water Acoustic Propagation
- Sea Level Measurement for Tsunami Warning System
- Electromagnetic Wave Propagation over Ocean Surfaces
- Studies of Over-Sea VHF Transmission Characteristics for Maritime Communications Systems
- Detection of Sea and Ice Conditions by HF/MF Radar

Ice and Icebergs:

- Heat, Mass and Momentum Transfer During Iceberg Melting
- Iceberg Drift
- Simulation of Wind Stress on Pack Ice
- Iceberg Scour
- Ice Mechanics
- Ice Friction

Ocean Structures:

- Dynamic Structure-Soil-Water Interaction Studies
- Floating Structures Including Offshore Nuclear Power Plants
- Submarine Pipe-Soil Interaction Subjected to Wave/Seismic Forces
- Simulation of Environmental Loading
- Hydroelastic Response of Plates and Propeller Blades Vibrating in a Fluid
- Fluid-Structure Interaction
- Wave Forces on Structures

Cold Ocean Oil Pollution

- Interfacial Tension and Contact Angle of Crude Oil Under Ice
- Interfacial Tension Determined from Single Sessile Drop
- Sessile Drop Contact Angles
- Oil Spill Mobility Under Ice
- Oil and Gas Under Ice
- Behaviour of Emulsified Crude Oil Spilled in a Cold Ocean

Information
Services:

Ocean Engineering Information Centre (OEIC) (jointly supported by C-CORE and the Ocean Engineering Group).

Publications: G.R. Peters, Editor, 1980. Work in Progress - 1980. Ocean Engineering Group. Faculty of Engineering and Applied Science. Memorial University of Newfoundland St. John's, Nfld.

The above report contains a listing of recent publications and Reports. Selected references from this list (relating primarily to Ice and Icebergs and Cold Water Oil Pollution) include:

T.R. Chari, G.R. Peters and K. Muthukrishnajah. Environmental Factors Affecting Iceberg Scour Estimates. cold Regions Science and Technology, Vol. 1 (1980) pp. 223-230.

T.R. Chari. Geotechnical Aspects of Iceberg Scours on Ocean Floors. Can. Geotechnical Journal, Vol. 15, No. 2, May 1979, pp. 379-390.

T.R. Chari, K. Muthukrishnajah and J.S. Rao. Bibliography on Geotechnical Investigation of Marine Sediments. Memorial University of Newfoundland Engineering and Applied Science Report #205, 1978, 22 pp.

T.R. Chari and S.N. Guha. A Model Study of Iceberg Scouring in North Atlantic. Offshore Technology Conference, Houston, Texas, May 1978, Vol. IV, pp. 2319-2326.

T.R. Chari, K. Muthukrishnajah. Model Study of Ocean Floor Scouring by Icebergs. Proc. of Speciality Conf. on Applied Techniques for Cold Environments, ASCE, Anchorage, AK, May 1978, pp. 828-839.

S.N. Guha. Breakout of Objects from Underconsolidated Sediments. M.Eng. thesis submitted to Memorial University of Newfoundland, September 1978.

S.N. Guha and T.R. Chari. Pull-out Resistance of Surficial Ocean Sediments. Presented at the 3rd CSCE Hydrotechnical Conf., Atlantic Region, Halifax, N.S., Feb. 1978.

H. Hamza and D.B. Muggeridge. Plane Strain Fracture Toughness (K_{IC}) of Fresh Water Ice. POAC 79 Proc., Trondheim, Norway, August 1979.

H.E. Hamza and D.B. Muggeridge. Elastic Creep Bending Analysis of Plates. Submitted for publication, ASCE J. of Applied Mechanics, May 1980.

H.E. Hamza and D.B. Muggeridge. Elastic Creep Bending Analysis of Floating Ice Covers. Submitted to IAHR International Symposium on Ice. July 1981, Quebec, Canada.

A. Kovacs and D.S. Sodhi. Shore Pile-up and Ride-up, Field Observations, Models, Theoretical Analyses. Workshop on Problems of the Seasonal Sea Ice Zone, Naval Postgraduate School, Monterey, CA, Feb 26 - Mar 1, 1979.

E.S. Large and J. Molgaard. An Ice Friction Tester Preliminary Design Proposal. Internal Report, Faculty of Engineering and Applied Science, Memorial University of Newfoundland.

R. Lopez, T.R. Chari, E. Moore, G.R. Peters, A. Zielinski. Hydrodynamic Effects on Iceberg Gouging. To appear in Cold Regions Science and Technology Journal, 1980.

J.D. Malcolm, C.D. Elliott. Interfacial Tension from Height and Diameter of a Single Sessile Drop or Captive Bubble. Canadian Journal of Chemical Engineering, Vol. 58, April 1980, pp. 151-153.

J.D. Malcolm and C.R. Dutton. The Interfacial Tension and Contact Angle of Crude Oil Under Ice. Proc. Fifth Intl. Conf. on Port and Ocean Engineering Under Arctic Conditions (POAC '79), Trondheim, Norway, August 1979.

J.D. Malcolm and H.M. Paynter. Simultaneous Determination of Contact Angle and Surface Tension from Sessile Drop Measurements. Submitted to Journal Colloid and Interface Science.

J.D. Malcolm, Studies of Oil Spill Behaviour Under Ice. Proc. Workshop on Oil, Ice and Gas, Toronto, Ont., Oct. 1979, pp. 47-54.

G.R. Peters. Sea Ice and Icebergs. Proc. Fifth Intl. Conf. on Port and Ocean Engineering Under Arctic Conditions (POAC '79), Trondheim, Norway, Aug. 1979. vol 3, pp. 41-59.

D.V. Reddy, M. Arockiasamy and P.S. Cheema. Response of Offshore Towers to Nonstationary Ice Forces. proc. Fifth Intl. Conf. on Port and Ocean Engineering Under Arctic Conditions (POAC '79), Trondheim, Norway, Aug. 1979.

D.V. Reddy, W. Bobby, M. Arockiasamy and A.K. Haldar. Wave-Induced Dynamic Response of Pipes Buried in Permeable Beds. proc. Conf. on Behaviour of Off-Shore Structures (BOSS), London, England, Aug. 1979.

D.V. Reddy and M. Arockiasamy (editors - Book). Introduction to Offshore Structures. Trans. Tech. Publications, Clasuthal, West Germany (under preparation).

D.V. Reddy, M. Arockiasamy, P.S. Cheema and N.P. Riggs.
Monte Carlo Simulation of Iceberg Impact Probabilities.
Cold Regions Science and Technology, Elsevier Scientific
Publishing Co., Holland, 1979.

D.S. Sodhi and M. El-Tahan. Prediction of an Iceberg Drift
Trajectory during a Storm. In press, Annals of Glaciology.

A.S.J. Swanidas and D.V. Reddy. Floating Ice Platforms used
for Offshore Drilling. Accepted for publication in the J.
of Glaciology, Great Britain.

N.W. Wilson and B.D. Vyas. Velocity Profiles Near a
Vertical Ice Surface Melting into Fresh Water. To be
published in Transactions, American Society of Mechanical
Engineers, Journal of Heat Transfer.

Agency: C-CORE (CENTRE FOR COLD OCEAN RESOURCES ENGINEERING)
Captain Robert A. Bartlett Building
Memorial University of Newfoundland
St. John's, Newfoundland A1B 3X5

Contact: David Bazeley Telephone: 709-737-8354

Objectives: To undertake engineering research that will assist the safe and orderly development of Canada's resources where cold and ice-frequented oceans are a problem; to develop Canadian expertise in ocean engineering; to contribute to the training of people competent to work within the ocean environment; and to carry out research programs in the public domain, with timely publication of research results.

Area of Expertise: (i) Ice Behaviour
(ii) Seabed Geological Engineering
(iii) Radar Remote Sensing
(iv) Hydrocarbon Pollution of Cold Oceans.

Current Projects: Developing a data bank on Labrador sea ice climate

Establishing an estimate of expected frequency and severity of iceberg scours for a site, based on latitude, bathymetry oceanography and ice environment.

Developing a sediment dynamics model for the Grand Banks, for surficial geological interpretation and seabed engineering design.

Developing a submersible corer and geotechnical platform to obtain cores of over-compacted seabed surficial sediments without resort to a dedicated drillship.

Evaluating the application of HF skywave radar using existing Canadian facilities to east coast oceanographic measurement.

Developing a Canadian capability in ground wave HF radar for surface current measurement, and evaluating the application of the technology for ice characterization and hazard detection.

Developing an airborne ice type, thickness and strength sensor and evaluating operational applications.

Designing, constructing and testing an alternate display system for PPI marine radar, which would be capable of ice type discrimination.

Information
Services:

Data acquired by C-CORE is, unless proprietary, held in a data bank, and is available for use: see Ocean Engineering Information Centre.

Publications:

Annual Report

C-Core News (Quarterly, no subscription charge)

Technical Publication Series: list included in C-CORE News

Selected Technical Reports. LeDrew, B.R. and Gustajtis, K.A., eds., "An Oil Spill Scenario for the Labrador Sea". Technical Report, 796 pp. Mar. 1978. This report was prepared for the Arctic Marine Oilspill Program (AMOP) developed by the Environmental Emergencies Branch of the Federal Environmental Protection Service. Requests for copies of the report should be directed to: Dr. S.L. Ross, Namagewr, Arctic Marine Oilspill Program (AMOP), Fisheries and Environment Canada, Ottawa, Canada K1A 0C8.

Dawe, B.R. and Parashar, S.K. "SAR Imaging of Waves in Ice". Preprint for Oceans '78, The Ocean Challenge, Washington, D.C., 1978, 14 pp., Jul. 1978.

Allan, A.J. "The Measurement of Surface Strain on Drake P-40 Artificially Thickened Sea Ice Drilling Platform". Technical Report, National REsearch Council, 53 pp., Dec. 1977.

Wedler, E. and Worsfold, R.D. "Satellite Ocean-Related Imagery Applications Program". Reprint for Oceans '78, The Ocean Challenge, Washington, D.C. 1978, 6 pp., Jun. 1978.

"Project SAR '77 Summary Report". Contract Report. 402 pp. November 1979. The work covered by this report was executed for the Atmospheric Environment Service of Fisheries and Environment Canada, with additional support from the U.S. Naval Office of Research.

"An Oilspill in Pack Ice". Contract Report, 231 pp., January 1980. The Work covered by this report was executed for the Arctic Marine Oilspill Program of the Environmental Protection Service, Requests for copies should be directed to: Environmental Emergency Branch, Environment Canada, 15th Floor, Pl. Vincent Massey, Ottawa, Ontario, K1A 1C8.

Barrie, J.V. "Iceberg - Seabed Interaction (Northern Labrador Sea)". "Annals of Glaciology, Vol. 1, No. 1, 1980, in press, 20 pp.

Rossiter, J.R. and Baseley, D.P. (eds.) "Proceedings of the International Workshop on the Remote Estimation of Sea Ice Thickness". St. John's, Newfoundland, September 25-26, 1979. Conference Proceedings. 505 pp., May 1980.

Rossiter, J.R., Butt K.A., Gamberg, J.B., and Ridings, T.F. "Airborne Impulse Radar Sounding of Sea ice". Preprint for the 6th Canadian Symposium on Remote SEnsing, May 21-23, Halifax, N.S., 8 pp.

Gaskill, H.S., Lopez, R.J. and Swaters, G.E. "Free Drift of Sea Ice: A Comparison of Models." Technical Report, 132 pp., October 1980.

Reimer, E.M. "Anticipated Oil Dispersion Rates in Pack Ice". Presented to the 1981 Oil Spill Conference, Atlanta, Georgia, March 3-5, 1981. 10 pp.

"Proceedings of the Workshop Sea Ice Field Measurement, St. John's, April 29 - May 1, 1980". Conference Proceedings, 362 pp., December 1980.

Butt, K.A. and Reimer, E.M. "Presentation of an HF Radar Development Program to the Eastern and Arctic Petroleum Operators Associations". 28 pp., may 1981.

Allan, A.J. and Bazeley, D.P. (eds). "Test Platforms for the Measurement of Ice Forces". Technical Report, 220 pp., May 1981.

Lewis, C.F.M. and Barrie, J.V. "Geological Evidence of Iceberg Groundings and Related Seafloor Processes in the Hibernia Discovery Area of Grand Bank, Newfoundland". In Proceedings of the Symposium on Production and Transportation Systems for the Hibernia Discovery, St. John's, February 17-19, 1981. In press.

Availability of C-CORE Publications

Technical Reports, "Data Reports and Conference Proceedings" are normally available from C-core. The availability of "Contract Reports" is noted individually. Preprints of papers presented by C-CORE members to external meetings or submitted to other publications are available from C-CORE, unless timely external publication is expected.

Agency: OCEAN ENGINEERING INFORMATION CENTRE, MEMORIAL UNIVERSITY
(OEIC)
Memorial University of Newfoundland
St. John's, Newfoundland A1B 3X5

Contact: Judith Whittick Telephone: 709-737-8377

Objectives: OEIC is sponsored by the Ocean Engineering Group, Memorial University, Faculty of Engineering and Applied Science, and C-CORE. Its principal role is to provide an information search service to members of the sponsoring groups in the subject field of cold ocean engineering.

Area of Expertise: Collection development. Provision of search service.

Information Services: The collection includes about 104 periodical titles.
A strong collection of international technical reports.
About 6,000 items from 1974 to date in the KWOC Index; items chiefly in the areas of sea ice research and offshore hydrocarbon development; KWOC Index updated regularly.
Collection of ice-condition maps from Ice Forecasting Central, U.S. Navy; weather charts from AES; charts of sea states (METOC); remote sensing imagery (CCRS)
Search service to sponsoring groups, to outside researchers on a contract basis.

Publications: OEIC KWOC Index produced three times per year on microfiche. Available on an annual subscription basis.
OEIC Information Bulletin. Available on an annual subscription basis.

Agency: THE ARCTIC INSTITUTE OF NORTH AMERICA (AINA)
University of Calgary
2500 University Drive N.W.
Calgary, Alberta T2N 1N4

Contact: Dr. Peter Schlederman Telephone: 403-284-3387
Executive Director

Objectives: The purposes of the Arctic Institute are to assist and co-operate in the orderly development of the Arctic and Middle North, and in the steady improvement in man's knowledge of the North and his ability to apply that knowledge. Founded in 1945, AINA is a non-profit, tax exempt, research and educational organization. Its activities embrace all scientific disciplines - natural and social. Although it is primarily concerned with the North, AINA's interests also extend to Antarctica and to alpine regions. The Arctic Institute is a research Institute of the University of Calgary.

Expertise: (See Projects)

Projects: The primary function of the Institute is the promotion and conduct of research in the natural and social sciences. Its program is of the broadest possible character, dealing with both fundamental and applied sciences. Projects range from small scale, highly specialized efforts by small groups or individual scientists, to expeditions with substantial personnel and embracing several aspects of science. Many of its projects are interdisciplinary or multidisciplinary, and many are international.

The Arctic Institute maintains permanent research facilities in the North. One of these facilities is the Kluane Lake Research Station from which the Institute provides logistic support for a number of research studies. These range from research carried out at the base camp to high mountain research using aircraft. One of these projects was the High Altitude Physiology Study, conducted at Camp Logan High 5,800 metres above sea level in the St. Elias Mountains. The Institute has also played a major role in the Devon Island Project, based at Truelove Lowland on the north coast of Devon Island in the eastern Arctic, where an integrated research programme on the ecology of the Arctic has been conducted. The Ellesmere Island Research Project is an archaeological field research project studying prehistoric sites spanning 4,000 years of High Arctic occupation. This has produced a large amount of data which is being analyzed at the Arctic Institute.

The Northern Political Studies program, a cooperative enterprise between the Institute and the Department of Political Science, is designed to promote a greater knowledge and understanding of political developments in Canada's north and in other Arctic regions. A companion program of the Northern Political Studies Program is a Strategic Studies Program for the Department of National Defence.

The Institute has completed an archaeological overview of the proposed Polar Gas pipeline route.

Research into the application of microbial technology to oil production could result in the development of production techniques useful in extending the production life of isolated and off-shore oil wells.

Information
Services:

The A.I.N.A library is administered by the University of Calgary Library. It was established in support of academic and scientific research. The collection spans all disciplines and interests - the physical, biological, technical, and social sciences. The size of the present collection stands at 15,500 bound volumes, 30,000 reprints, and 1,000 serials. The collection also includes a small number of microfilms, phonographic records, photographs, and northern maps - topographic sheets of Alaska, Canada and Greenland, as well as Canadian hydrographic charts. In addition, the Library has a small collection of rare books. While most of the collection is in English, a significant proportion is in Russian and the Scandinavian languages.

The Library is open to the public which is welcome to use the collection on the premises or through the inter-library loan process. For further information please contact Northern Studies Librarian, in charge of AINA Library: William R. Maes 403-284-5966.

Conferences

The Institute sponsors and organizes conferences and symposia concerning subjects pertinent to northern research and development. These have included "Arctic and Middle North Transportation".

Publications:

- 1) Arctic, multidisciplinary quarterly journal of the Institute
- 2) The Coast and Shelf of the Beaufort Sea
- 3) Polar Oceans
- 4) Arctic Bibliography (16 volumes)
- 5) Arctic Environmental Workshops Volumes 7-8-9

Agency: BOREAL INSTITUTE FOR NORTHERN STUDIES
University of Alberta (BINS)
Library, C.W. 401 Biological Sciences Building
University of Alberta
Edmonton, Alberta T6G 2E9

Contact: Mrs. G.A. Cooke Telephone: 403-432-4409
Head Librarian Telex: 037-2979

Objectives: The acquisition and dissemination of knowledge of the North through development of a library and information centre, provision of training and instruction and implementation and encouragement of research.

Projects: The Library provides "back-up" to the Institute's teaching and research by collecting and making available bibliographic and other material. It also serves as a publically available information centre. Materials range from school level to highly scientific.

Information Services: Library collection - a small portion of the bibliographic, periodical and vertical file collections relates to marine transportation in the areas of ice engineering, oil spills, remote sensing.

Canadian Ice Distribution Survey - a collection of references from letters, newspapers, magazines covering all of Arctic Canada from 1951-1954. Prepared by the Department of Mines and Technical Surveys.

Boreal Northern Titles data base - an index of 650 titles of periodicals, government documents, northern newspapers. Access by title keyword and author surname (see publications). Available for on-line searching from Q.L.

All files available to outside researchers by personal visit. ILL service provided.

Courses/Programs

Far Northern Schools. These schools provided by the Institute and the Faculty of Extension of the University of Alberta:

- Eastern Arctic Winter School
- Arctic Summer School
- Yukon Summer School

Further details available from the Institute or the Faculty of Extension of the University of Alberta.

Boreal Circle - six meetings of informal group per year, October-March. Guest speakers invited.

Details of educational activities available from Boreal Newsletter or by writing to the Institute.

Reference:

Information from:

Margaret C. MacKay and Ann L. Pool. November 1980. Guide to marine transportation information sources in Canada. Transport Canada Report No. TP 2431. Transportation Development Centre. Montreal, Quebec. p. 182-183.

Agency: ARCTIC INSTITUTE OF NORTH AMERICA -
ARCTIC SCIENCE AND TECHNOLOGY INFORMATION SYSTEM
The University of Calgary
2500 University Dr. N.W.
Calgary, Alberta T2N 1N4

Objectives: The purpose of the Arctic Science and Technology Information System (ASTIS) is to improve accessibility of existing information about arctic regions. Support for the project is provided by the Arctic Petroleum Operators Association and the Arctic Institute of North America.

Contact: Ross Goodwin Telephone: 403-284-7515
Manager, ASTIS

Information Services and Publications: ASTIS Current Awareness Bulletin
A bi-monthly publication designed to get information about new arctic literature to customers quickly. Each issue is approximately 65 pages long, and contains about 400 citations. Citations are arranged by subject, with geographic and author indexes. Each Bulletin lists documents received during the two-month period indicated on the issue cover, and is mailed about three weeks after the end of that two-month period.

ASTIS Bibliography

An annual microfiche bibliography containing the complete contents of the ASTIS database, including detailed subject, geographic, author, and title indexes. Each edition is fully cumulative, containing the citations from all previous editions, as well as from all previous issues of the ASTIS Current Awareness Bulletin.

ASTIS Online Database

The ASTIS database containing 7000 documents (August 1981) is available for online searching from QL Systems Ltd, Ottawa.

ASTIS Reference Service

ASTIS will answer telephone or mailed requests for literature searches on northern topics by performing online searches of the ASTIS database as well as other relevant databases. The ASTIS Reference Service is intended for customers who do not have the training or equipment to perform their own online searches.

ASTIS Special Bibliographies

ASTIS will enter into contracts to prepare special bibliographies on particular subjects or geographic areas. The results of any ASTIS online search can be used to automatically generate a fully-indexed bibliography in camera ready form, which can then be published as a bound volume.

APOA Bibliography

The first special bibliography that ASTIS has prepared contains all documents produced or funded by the Arctic Petroleum Operators' Association as of October 1980. The APOA Bibliography is 83 pages long and contains 250 documents, plus title, author, subject, and geographic indexes. Major topics include sea ice research, oceanography, environmental studies, oil spills, transportation, and cold weather clothing. This bibliography will be updated periodically as more APOA project reports are released.

Agency: BEDFORD INSTITUTE OF OCEANOGRAPHY
P.O. Box 1006
Dartmouth, N.S. B2Y 4A2

Contact: BIOMAIL
(Bedford Institute of Oceanography Marine and Industrial Liaison).

John Brooke Telephone: 902-426-3698
Industrial Liaison Officer, BIOMAIL

LIBRARY Telephone: 902-426-3675
Mrs. Betty Sutherland, Library Service

Objectives: The business of the Institute is the acquisition of new knowledge about the marine environment and the development of new technology to observe and measure that environment. The Institute also reviews environmental problems and their impact on marine resources. Hydrographic charting and geoscience mapping and the search for mineral resources also account for a proportion of the effort.

Area of Expertise: The Bedford Institute of Oceanography (BIO) is a Government of Canada establishment that undertakes oceanographic research and hydrographic surveys in a wide range of marine environments. Components of several federal government departments are housed at BIO. These include the following major groups:

Department of Fisheries and Oceans (DFO)
Ocean and Aquatic Sciences, Atlantic

Atlantic Oceanographic Laboratory
Divisions: Chemical Oceanography, Coastal Oceanography,
Metrology, Ocean Circulation

Canadian Hydrographic Service, Atlantic Region
Divisions: Field Charting and Cartography, Hydrographic
Development, Navigation, Tidal

Marine Ecology Laboratory
Divisions: Biological Oceanography, Fisheries Oceanography,
Environmental Quality

Institute Facilities
Divisions: Ships, Engineering Services, Computing Services,
Library Services, Publication Services

Department of Energy, Mines and Resources (DEMR)
Geological Survey of Canada

Atlantic Geoscience Centre

Divisions: Eastern Petroleum Geology, Environmental Marine Geology, Regional Reconnaissance, Program Support

Also housed at BIO are part of the Marine Fish Division of DFO (Fisheries Management), the Seabird Research Unit of the Department of the Environment (DOE), an office of the Resource Management Branch of DEMR, and a laboratory division of the Environmental Protection Service of DOE.

Information
Services:

BIOMAIL - Bedford Institute of Oceanography Marine Advisory and Industrial Liaison.

The BIOMAIL office provides a point of entry to the Bedford Institute for anyone seeking information on Canadian oceanography and related topics. The specific function of the BIOMAIL office are:

- (1) to distribute and provide interpretations of oceanographic information and data to industry and government departments;
- (2) to encourage the transfer of technology to Canadian industry and the healthy growth of ocean industry, especially in Atlantic Canada;
- (3) to facilitate contractual relations for all aspects of ocean research and development between Canadian industry and BIO;
- (4) to co-ordinate the Institute's review of unsolicited proposals; and
- (5) to advise industry on what government funding is available for the transfer of technology.

The BIOMAIL office will also encourage ocean research and development companies to establish facilities on the Institute campus.

The Library houses about 10,000 volumes of report and monograph literature including POAC material, offshore conference proceedings, pilot series, material on coastal engineering; 1200 periodicals; good retrospective collection of oceanographic material. The Library collects exhaustively in Canadian oceanographic material, research material in French and English internationally, 8,500 fiche are housed including NTIS material and BIO reports.

The serials list is computerized and KWIC indexed. Maps are not held in the Library but Woods Hole charts, seatracts and Geosea maps are housed elsewhere in the Institute. A small atlas collection is in the Library.

A complete set of Canadian Hydrographic Service Charts and field sheets and coastal topographic maps is held by the Regional Hydrographer.

The Library is a member of the Nova Scotia On-line Consortium with on-line access to Lockheed, SDC, Can-Ole, Q.L., MRIS, RESORS, etc. A complete listing is available from the Library.

Publications: Biennial Review. Latest is 1977-78
BIO, Report Series.
BIO, Data Series.
BIO, Computer Note Series.

Major publications are listed in the Biennial Review.
Publications list planned for 1980.

Accessions List published by the Library

Reference: BIOMAIL - Information Folder

Margaret C. MacKay and Ann L. Pool. November 1980. Guide to marine transportation information sources in Canada. Transport Canada, Report No. TP 2431. Transportation Development Centre. Montreal, Quebec p. 27-28.

Agency: DEPARTMENT ENERGY, MINES AND RESOURCES
DIVISION OF SEISMOLOGY AND GEOTHERMAL STUDIES
Earth Physics Branch
1 Observatory Crescent
Ottawa, Ontario
K1A 0Y3

Contact: P.W. Basham Telephone: 819-995-5548
Division of Seismology and Geothermal Studies
Earth Physics Branch
Ottawa, Ontario
K1A 0Y3

Dr. D.H. Weichert
Pacific Geoscience Centre
Earth Physics branch
Sidney, B.C. V8L 4B2

Objectives: 2.a) Operation of Canadian seismograph networks.
b) Preservation and dissemination of Canadian
seismological data
c) Determination of the parameters and effects of
Canadian earthquakes
d) Research on seismic risk in Canada
e) Research on earthquake processes and seismotectonics

Current
Projects: A joint venture with Dome Petroleum was negotiated in 1980
under which additional seismograph stations are being
installed around the periphery of the Beaufort Sea. Data
from these stations are assimilated with the national
program (2c, above) at the Pacific Geoscience Centre in
Sidney, B.C.

Planning is underway for additional cooperative projects
that will involve Dome Petroleum, the Earth Physics Branch
and the Geological Survey of Canada in the deployment of
ocean-bottom seismographs in the Beaufort Sea and subsequent
analysis of data to more accurately delineate the earthquake
zones.

Agency: GEOLOGICAL SURVEY OF CANADA
Resource Geophysics and Geochemistry Division
Terrain Geophysics Section
601 Booth Street
Ottawa, Ontario K1A 0E8

Contact: J.A. Hunter Telephone: 613-593-5969

Objectives: Investigation of Seismic Properties of Permafrost Materials
SPECIFIC OBJECTIVE - Mapping of Sub-seabottom Permafrost and
Properties in the Beaufort Sea using Seismic Techniques

Area of Expertise: Knowledge of sub-seabottom permafrost distribution, ice-
content, lithology, thickness and temperature regime

Current Projects: See Project Information Sheet 65
Sub-seabottom permafrost mapping - Beaufort Sea.

Information Services: a) Geological Survey of Canada (GSC) publications office
for GSC reports.
b) Most publications are to be found in conference
proceedings and external journals.
c) Large volume of unpublished permafrost distribution
material on file at GSC.

Agency: EARTH PHYSICS BRANCH
DIVISION OF SEISMOLOGY AND GEOTHERMAL STUDIES
Department of Energy, Mines and Resources
1 Observatory Crescent
Ottawa, Ontario K1A 0Y3

Contact: Dr. A.S. Judge Telephone: 613-995-5490
Mr. A.E. Taylor
Ms. M. Burgess

Objectives: The general objective of the Geothermal Service are as follow, those specifically related to Beaufort Sea underlined.

SUB-ACTIVITY 5.2 - The Geothermal Service

OBJECTIVE: To characterize the thermal regime of significant structural units of the Canadian landmass both on- and off-shore; to make Laboratory measurements of the thermal parameters of rock and soil samples; to provide a national data base on geothermal data and properties including permafrost; to complete an assessment of the geothermal potential of all young volcanic belts; to complete a regional assessment of the geothermal potential of western sedimentary basins by 1983; to coordinate government Research, Development and Demonstration in Geothermal energy and to assess the potential for geothermal energy in all parts of Canada with emphasis on the Cordillera: To improve the ability by 1985 to predict the distribution of permafrost and gas hydrates both on- and off-shore; to improve the understanding of permafrost processes and the response of frozen ground to both man made and natural thermal stress disturbances.

Area of Expertise:

Current Projects: Specific projects with implications for the Beaufort Sea are:
PROJECT 6.2.5 - Permafrost Research Related to Frontier Hydrocarbon Exploration, Production and Transportation

OBJECTIVE: To assess the impact of permafrost-related processes on northern hydrocarbon exploration, production and transportation.

Sub-project: 5.2.5.1 Moisture migration phenomenon in frozen soils.

Objective: Through contract research to develop an improved understanding of the nature of and factors governing the

moisture content of frozen soils and its mobility, for the improved design of major civil engineering work such as pipelines.

Sub-project: 5.2.5.3 Offshore permafrost beneath the Beaufort Sea.

Objective: To conduct problem-oriented research to improve the present knowledge of the occurrence and structure of sub-sea permafrost in the Beaufort Sea, an area of high hydrocarbon potential.

Sub-project: 5.2.5.4 Gas hydrates

Objective: To improve understanding of the distribution and nature of gas hydrates sufficient to predict or determine their presence, assess their risk to drilling and production and examine their role in long-term gas resources.

See Project Information Sheets 75 to 78 for additional information.

Publications: Selected papers relating to Northern and Offshore Development resulting from work done or contracted by the Geothermal Service (since 1975).

Raj. P. And Judge, A.S. (1979, in press). Permafrost studies in northern Quebec. Geogr. Phys. Quot. 33, p. 245-252.

Hunter, J.A., Judge, A.S., MacAuley, H.A., Good, R.L., Gagne, R.M. and Burns, R.A. 1976. Permafrost and frozen sub-seabottom materials in the Southern Beaufort Sea Beaufort Sea Project Tech. Rept. No. 22, D.O.E. 174 p.

Judge, A.S. 1977. Distribution of permafrost in northern Devon Island. in Truelove Lowland Devon Island, Canada; a High Arctic Ecosystem. Edit. L. Bliss, University of Alberta Press, p. 26-30.

Judge, A.S. 1976. Permafrost, hydrates and offshore thermal regime. Tech. Memo No. 119, Assoc. Comm. Geotech. Res., MRC, 99-113.

Hunter, J.S. and Judge, A.S. 1977. Geophysical investigations of sub-sea permafrost in the Canadian Beaufort Sea. In Proceed. 3rd Intern. Conf. on Port and Ocean Engineering. U. of Alaska, Fairbanks. p. 1025-1058, 1977.

Davidson, D.W., El-Defrawy, J. and Judge, A.S. 1978. Natural gas hydrates in Northern Canada. In Proceeds. Third International Permafrost Conf., 1, p. 938-943.

Neave, K.G., Judge, A.S. and Hunter, J.A. 1979. Offshore permafrost distribution in the Beaufort Sea as determined from temperature and seismic observations. Assoc. Comm. Geotech. Science Tech. Memo No. 124.

Taylor, A.E., Wetmiller, R. and Judge, A.S. 1979. Two risks to drilling and production off the East Coast of Canada - Earthquakes and Gas Hydrates. In Proceed. Sympos. on Research in the Labrador Coastal and Offshore Regions, Memorial Unvi. Press, p. 91-105.

Jessorp, A.M. and Judge, A.S. 1975. Temperature measurements in boreholes for the mining industry. In Borehole Geophysics Applied to Metallic Mineral Prospecting: A Review, G.S.C. Paper 75-13, p. 55-65.

Judge, A.S. 1975. Geothermal studies in the Mackenzie Valley by the Earth Physics Branch. Geothermal Series No. 2, Earth Physics Br., 12 p.

Taylor, A.E. and Judge, A.S. 1975. Geothermal Data Collection - Northern Wells 1974. Geothermal Series No. 3, Earth Physics Br., 170p., 1975.

Judge, A.S., MacAuley, H.A. and Hunter, J.A. 1975. Anomalous Seismic refraction velocities in Mackenzie Bay, N.W.T. G.S.C. Report of Activities 76-1A.

Judge, A.S., Hunter, J.A., Good, R.L., Cowan, J., and Robb, G. 1975. Thermistor cable installation in permafrost materials with a water-jet drilling method, G.S.C. Report of activities 76-1A.

Taylor A.E. and Judge, A.S. 1976. Canadian Geothermal Data Collection - Northern Wells 1975. Geothermal Series No. 6, Earth Physics Br., 142 p.

Judge, A.S., MacAuley, H.A. and Hunter, J.A. 1976. An application of hydraulic jet drilling techniques to mapping of sub-seabottom permafrost. G.S.C. Report of Activities 76-1C, p. 75-78.

Lewis, C.F., Bornhold, B.D., Glasco, S.M., McLaren, P., Hunter, J., Judge, A.; Kerr, J. 1977. Marine geological and geophysical activities in Lancaster Sound and adjacent Fiords. G.S.C. Report of Activities 77-1A, 495-506.

Taylor, A.E. and Judge, A.S. 1977. Canadian Geothermal Data Collection - Northern Wells 1976-77. Geothermal Series No. 10, Earth Physics Branch, 194 pp.

Collier, J. and Judge, A. 1977. A survey of seabottom temperatures and salinities in Barrow Strait. Earth Physics Branch, Open File No. 77-24, 34 pp.

MacAuley, H.A., Judge, A.S., Hunter, J.A., Allen, V.S., Gagné, R.M., Burgess, M., Neave, K.G. and Collier, J. 1977. A study of seabottom permafrost in the Beaufort Sea Mackenzie Delta by hydraulic drilling methods. Earth Physics Branch, Open File No. 77-16, G.S.C., Open File No. 472, 80 pp.

Neave, K.G., Judge, A.S. and Hunter, J.A. 1978. Offshore permafrost distribution in the Beaufort Sea as determined from temperature and seismic observations. G.S.C. Paper 78-1C, p. 13-18.

Judge, A.S., and Jessop, A.M. 1978. Heat flow north of 60°N. in Arctic Geophysical Review, Public Earth Physics Branch, 45, p. 25-34.

Judge, A.S., Bruggess, M., and Taylor, A.E. 1979. Canadian Geothermal Data Collection - Northern Wells 1978. Geothermal Series No. 11, Earth Physics Branch, 187 pp.

Judge, A.S., Taylor, A.E. and Rutledge, L. A Supplement of the Canadian Geothermal Data Collection - Northern Wells 1977-78. Earth Physics Branch Open File Report -79-13, 64 pp., 1979.

MacAuley, H.A., Judge, A.S. Hunter, J.A., Burgess, M., et al. A study of sub-seabottom permafrost in the Beaufort Sea-Mackenzie Delta by hydraulic drilling methods. Earth Physics Branch Open File Report No. 79-11, 42 pp., 1979.

Brown, R.J.E., Judge, A.S., Taylor, A.E. and Gratton-Bellew, P. A permafrost monitoring programme at Alert, N.W.T. - Project description and preliminary results. Earth Physics Branch Open File Report No. 79-5, 48 pp., 1979.

Judge, A.S., Preservation of wells drilled from artificial islands for permafrost studies. Internal Report 9 p. + diagrams 1975.

Judge, A.S., Geothermal studies in Northern Canada - 1975 field season Geothermal. Internal Report 75-5, 1975.

Judge, A.S. and Taylor, A.E. Preservation of Arctic Wells for subsurface temperature observations. Geothermal Service Internal Report 76-1 21 p. 1976.

Judge, A.S. The thermal character of the sediments beneath the Beaufort Sea and the implications for offshore drilling. Geothermal Service Internal Report 76-3 9 p. + diagrams, 1976.

Judge, A.S. Permafrost, hydrates and the offshore thermal regime. Geothermal Service Internal Report 76-7 11 p. + diagrams, 1976.

Judge, A.S. Notes on northern environmental terrain hazards (Thermal Hydrological aspects). Rept. to A.I.P.P. (D.O.E.) 4 p. 1976.

Burgess, M.M. and Judge, A.S. Thermal observations conducted as part of Beaufort Delta Oil project Ltd.: sampling cruise on the M.S. Norweta. Geothermal Service Internal Report No. 7701, 12 p + figs. + appendice, 1977.

Judge, A.S., Cold Regions Engineering Research and Development: Future Needs. Geothermal Service Internal Report 78-4, 14 p. + appendices, 1978.

Judge, A.S. Reports on United States and Canadian Permafrost Meetings, 1977. Geothermal Service Internal Report 78-3, 81 pp., 1978.

Judge, A.S. Environmental Impact Statement on Alaska Gas Pipeline Project: Technical review of permafrost-related problems. Geothermal Service Internal Report 79-7, 14 pp., 1979.

Burgess, M., Allen, V. and Judge, A.S. Shallow borehole temperature profiles in permafrost terrains - Dempster and Alaska Highways, 1978 Geothermal Service Internal Report 79-10, 28 pp., 1979.

Taylor, A.E. and Judge, A.S. Permafrost distribution in the Far North and subject of on-going research. Northern Miner July 15, p. 16-17, 1976.

Taylor, A.E. and Judge, A.S. Permafrost studies provide data for future Arctic developments. Oilweek August 23, p. 12-16, 1976.

Taylor, A.E. Temperatures and heat flow in a system of cylindrical symmetry included a phase boundary. Geothermal Series No. 7, Earth Physics Branch, E.M.R., 100 p., 1978.

Taylor, A.E. The thermal regime modelled for drilling and producing in permafrost. J. Canad. Petrol. Technol., April-June, p. 59-66, 1979.

- Raj, P.P. and A.S. Judge. Coupled two-dimensional heat-mass flow model for the prediction of sub-seabottom permafrost. EOS, 58 1130, 1977 (abstract).
- Taylor, A.E. A finite difference programme to solve the transient heat conduction equation involving latent heat in cylindrical symmetry. Earth Physics Br., Open File, 78-8, 180 pp., E.M.R., 1978.
- Hardy, R.M. and Assoc. Computer simulation study of groundwater and thermal regimes in an Arctic (Permafrost) streambed environment. Unpublished Rept., Contract CS-3232, 43 p., 1976.
- King, M.S. Development of laboratory equipment for the measurement of the thermal conductivity of permafrost materials. Unpublished report contract OSQ5-0070, E.M.R., 10 p., 1977.
- Taylor, A.E. Numerical modelling of transient thermal disturbance in boreholes in permafrost areas. 1978 Fall Meeting Program, AGU, p. 34, 1978 (abstract).
- Wankiewicz, A. Temperature measurements under arctic streams. In Proceedings Sympos. on Permafrost Geophysics. Tech. memo no. 124; Assoc. Comm. Geotech. Res. N.R.C., pp. 191-206, 1979.
- Brown, R.J.E. Influence of climate and terrain on ground temperatures in the continuous permafrost zone of Northern Manitoba and Keewatin District, Canada. in Proceedings of Third International Permafrost Conference, NRC, p. 15-21, 1978.
- Michel, F.A. and P. Fritz. Environmental isotopes in permafrost-related waters along the Mackenzie Valley Corridor. in Proceedings of Third International Permafrost Conference, NRC, p. 207-211, 1978.
- Smith, M.W. and Patterson, D. An investigation into the use of time-domain reflectometry to determine the unfrozen water content of freezing soils, Earth Physics Br., Open File 79-14, 37 pp., E.M.R., 1979.
- Williams, P.J. and E. Perfect. Investigation of water movement through frozen soils. Earth Physics Br., Open-File 79-15, 36 pp., E.M.R., 1979.
- Michel, F. and P. Fritz. Laboratory and field studies to investigate isotope effects occurring during the formation of permafrost. Earth Physics Br., Open-File 79-16, 65 pp., E.M.R., 1979.

Clouter, M.J. and H. Kiefte. The acoustic properties of methane hydrate by Brillouin spectroscopy - a preliminary report. Earth Physics Br., Open-File 79-18, 18 pp., E.M.R., 1979.

Taylor, A.E. A permafrost monitoring programme at Alert, N.W.T. - the first year of data. Earth Physics Br., Open-File 79-17, 31 pp., E.M.R., 1979.

Michel, F. and P. Fritz. Environmental Isotopes in permafrost-related waters along two proposed pipeline routes. Earth Physics Br., Open-File 77-15, 60 pp., E.M.R., 1977.

Michel, F. and P. Fritz. Laboratory studies to investigate isotope effects occurring during the formation of permafrost. Earth Physics Br., Open-File 78-5, 43 pp., E.M.R., 1978.

Burgess, M. and L. Routledge.. Shallow borehole temperature profiles in permafrost terrains, Alaska Highway, July 1979. Geothermal Service Internal Rept. No. 79-11, Earth Physics Br., 10 pp., E.M.R., 1979.

Perfect, E. and P.J. Williams. Thermally induced water migration in frozen soils. Cold Regions Research and Development (in press), 1980.

Patterson, D.E. and M.W. Smith. The use of time-domain reflectometry for the measurement of unfrozen water content of frozen soils. Cold Regions Research and Development (in press), 1980.

King, M.S. Thermal conductivity measurements on saturated rocks at permafrost temperatures. Canad. J. Earth Science, 16, p. 73-79, 1979.

Judge, A.S., M. Burgess, V. Allen and A. Taylor. Thermal studies at Illisarvik prior to lake drainage. Assoc. Comm. Geotech. Res. Tech. memo (in press) 1980.

Judge, A.S., A.E. Taylor, M. Burgess and V. Allen. Geothermal investigations at Illisarvik - 1979 in Drained Lake Experiments for investigation fo Growth of Permafrost in the Western Arctic, a progress report to Permafrost Subcommittee, NRC, 1980.

Judge, A.S. Natural gas hydrates in Canada. Assoc. Comm. Geotech. Res. Tech. Memo (in press) 1980.

Sweeney, J.F., R.L. coles, J.M. DeLaurier, D.A. Forsyth, E. Irving, A Judge, L.W. Lobczak, R.J. Wetmiller. Arctic geophysical review - a summary in Arctic Geophysical Review, edit. J. Sweeney, Earth Physics Br. Publ. 45, p. 101-108, 1978.

Agency: CANADA CENTRE FOR REMOTE SENSING
Energy, Mines & Resources Canada
2464 Sheffield Road
Ottawa, Ontario K1A 0Y7

Contact: E.A. Godby Telephone: 613-993-0121
Director General

Objectives: Provision of satellite and aircraft remotely sensed data
over the Canadian landmass and contant areas.

Area of Source of LANDSAT data 1972-81, SEASAT data - 1977 and
Expertise: aircraft data 1978-81 for Beaufort Sea.
Expertise in sea-ice data acquisition

Projects: RADARSAT, LANDSAT-D, CV-580 flights (P.I.S. 114)

Information Satellite Data: J. Heffernan 613-995-1210
Services: Aircraft Data: G. Fitzgerald 613-998-3101
Library: B. McGurrian 613-995-1210

Publications: CCRS Newsletter
Canadian Symposium on Remote Sensing.

Agency: GEOLOGICAL SURVEY OF CANADA
ATLANTIC GEOSCIENCE CENTRE
Bedford Institute of Oceanography
Darmouth, Nova Scotia B2Y 4A2

Contact: Dr. M.J. Keen Telephone: 907-426-2367
or
S.M. Blasco Telephone: 907-426-2694
Atlantic Geoscience Centre, Environmental Marine Geology

Objectives: The Atlantic Geoscience Centre, a division of the Geological Survey of Canada, is responsible for scientific investigations related to the geology and geophysics of Eastern Canada in both the onshore and offshore sedimentary basins.

The objective of the Centre is to provide geological knowledge and expertise in areas which may lead to the exploitation of Canada's resources. In the sedimentary basins, oil and gas are important potential natural resources and recent significant gas discoveries in the offshore areas may lead to future production. Underwater mining could become an important factor in the future. Good management of the environment also has many geological implications.

Area of Expertise: The work of the Centre falls into four categories: regional reconnaissance and mapping; evaluation of potential resources; environmental geology; and research and development.

Projects: Environmental Marine Geology Sub-division:
- Surficial Geology and Geomorphology: Mackenzie Bay - Continental Shelf (P.I.S. 18)
- Coastal Erosion: Sedimentation, Northern Somerset Island, N.W.T. (P.I.S.22)
- Consulting Advice on Conservation and Restoration of Coastal Areas.
Coastal Reconnaissance of Bylot and N.E. Baffin Islands, N.W.T. (P.I.S. 21)
- Coastal Reconnaissance of the Sverdrup Basin, N.W.T. (P.I.S. 20)
- National Energy Program: Beaufort Sea Seabed Geotechnical Research (P.I.S. 23)

Information Services: Geological survey of Canada (GSC)
publications - office for GSC reports.

Agency: EMPLOYMENT & IMMIGRATION COMMISSION CANADA
Alberta/NWT Region
5th Floor
9925 - 109 Street
Edmonton, Alberta
T5K 2J8

Contact: Mr. Kieth Patterson Telephone: 403-420-2428
Consultant
Labour Market Development Branch
Alberta/NWT Region
Edmonton

Objectives: The main responsibility in the Beaufort Sea is that of encouraging Manpower Planning by the companies involved in these projects. Manpower Planning is a process that enables an organization to maximize the use of its' human resources by planning to supplement these resources to a required level in order to meet their future requirements. In other words, through planning and organization, with the involvement of both management and labour, companies endeavour to place the appropriate number of people with the required skills in the right place, at the right time, to try to achieve the objectives established by the organization.

The NWT faces an immense expansion of resource based industries in the 1980s through development activities planned for the Beaufort Sea, Petro Canada's Arctic Pilot Project, and other proposals such as the Polar Gas "Y" line. These activities will correlate closely to a sharp escalation in the mining sector through planned expansions and new ventures. This will lead to a NWT labour market characterized by critical labour shortages, and prove the current mechanisms are inadequate in meeting the requirements or demands placed upon them. The result will be serious shortages of skilled personnel and cause labour supply bottlenecks at both the micro and national levels.

To briefly summarize, the CEIC encourages the utilization of Manpower Planning by industry to meet their goals and objectives, and at the same time, provide opportunities for Canadians to participate in these benefits. We hope this will result in:

- a) Reducing to a minimum the quantitative and qualitative imbalances on the labour market through industry using long range human resource requirement forecasts that will provide sufficient lead time to overcome the imbalances.
- b) The maximization of employment opportunities to ensure that Canadians are the recipients of the benefits flowing from these projects.

c) Both levels of government to implement, with sufficient lead time, the planning, coordination, and actioning of programs and services that will be of most benefit to the economy.

Areas of
Expertise:

A brief outline of the programs and services offered by the commission is provided in "Employment Programs and Services for Canadians" published by Ministry of Supply and Services. Cat. No. L31-26/1981. ISRN 0-663-51262-6.

Publications:

The publication, "Territorial Guidelines to Manpower Planning" is distributed to industry as a guide to encourage employers to adopt the philosophy of Manpower Planning in meeting their resource requirements.

Agency: LANDS DIRECTORATE
LAND RESOURCE AND DATA SYSTEMS BRANCH
Environment Canada
Ottawa, Ontario K1A 0E7

Contact: J. Thie, Director Telephone: 819-997-1090

Objectives: The Lands Directorate's responsibilities are guided within the context of the mandates of the Department of the Environment. They include:

- Research concerning land use change and trends, the ecological and resource characteristics of land, and land use planning methodologies;
- promotion of the protection and appreciation of critical or prime land areas of national significance; and
- provision of environmental baseline information and promotion of public and governmental understanding of conservation principles and appropriate land use measures.

Expertise: The researchers here possess expertise in a range of disciplines (computer science, cartography, pedology, botany, geomorphology, hydrology, remote sensing, land use and so on), and considerable operational experience throughout Canada and especially the Yukon and Northwest Territories.

Projects: Northlands Ecoregions - (P.I.S. 15)

Ecodistrict mapping for the Northwest Territories - (P.I.S. 16)

Ecological baseline Information System for the Beaufort Sea Planning Area - (P.I.S. 17)

Information Services: Various forms of mapped land resource or land use information is available upon request; these cover the Northern Land Use Information Series (NLUIS) and various areas and specific ecological land surveys; the NLUIS series are presented on 1:250,000 map base while the ecological surveys have been conducted on various map bases. Certain data bases such as the northern Yukon study are entered in the Canada Land Data System.

Publications: Lands Directorate Publications. March, 1980. Supply and Services Canada - Cat No. EN72 - 3/1980.

Agency: ATMOSPHERIC ENVIRONMENT SERVICE
ATMOSPHERIC ENVIRONMENT SERVICE - ICE BRANCH
4905 Dufferin Street
Downsview, Ontario M3H 5T4

Contact: W.E. Markham Telephone: 416-667-4727
Director, Ice Branch

Objectives: Ice services in support of marine activities - in northern waters as well as East Coast.

Areas of Expertise: Ice reconnaissance, prediction and data analysis.

Projects: Aerial reconnaissance at least once each winter, twice in spring, and 3-4 times per week from mid-June to end of October; interpretation of satellite imagery for similar times, daily ice prediction during navigation season, data analysis and atlas preparation. Special ice prediction modelling studies are also conducted by AES.

Ice services in support of marine activity. (P.I.S. 19)

Information Services: Extensive data base of ice conditions since 1959, primarily May to October inclusive; can be examined in Ottawa office.

Publications: Ice Atlas - Canadian Arctic Waters Published March '81.

Ice Summary and Analysis, Canadian Arctic - annual - 1964-1973.

Composite Ice Charts - weekly - June to October by mail subscription.

Agency: ATMOSPHERIC ENVIRONMENT SERVICE - Western Region
Argyll Centre
6325 - 103 Street
Edmonton, Alberta T6H 5H6

Contact: B.M. Burns Telephone: 403-437-1250
Regional Director

Objective:

1. provide forecast services for Yukon and NWT;
2. operate meteorological data acquisition for Yukon, NWT;
3. undertake meteorological studies in support of impact studies.

Areas of Expertise:

- Strong expertise in operational meteorology with respect to Beaufort Sea area.
- Limited expertise in environmental impact of ice and sea state conditions.

Current Projects:

1. Operational weather support to offshore drilling Beaufort Sea area. (P.I.S. 36)
2. Study of "Environmental Aspects of Arctic Marine Transportation: Sea State, Ice and Weather." (P.I.S. 35)

Information Service: For information contact: B.M. Burns, Regional Director.

Publications: Annual Report on Beaufort Sea Weather Office operation.

Agency: ATMOSPHERIC ENVIRONMENT SERVICE
METEOROLOGICAL SERVICES RESEARCH BRANCH
4905 Dufferin Street
Downsview, Ontario, Canada M3H 5T4

Contact: Dr. I.D. Rutherford Telephone (416) 667-4808
Director
Meteorological Services Research Branch

Objectives: Operational R & D supporting AES weather, ice and sea state information and forecast services, including a national Numerical Weather Prediction Program, sea-ice prediction modelling, wave and swell forecasting procedures, empirical marine weather forecasting, marine oil spill trajectory forecasting, associated operational systems design and satellite remote sensing supporting weather, ice and sea state services.

Areas of Expertise: Numerical weather prediction and associated data assimilation
Sea-ice modelling and prediction
Marine oil spill trajectories
Wave and swell forecasting
Operational systems design
Weather satellites and operational systems

Current Projects: (1) sea-ice modelling R & D (P.I.S. 42)
(2) marine oil spill trajectories R & D (P.I.S. 40)
(3) wave and swell forecasting R & D (P.I.S. 41)
(4) satellite ice status system R & D (P.I.S. 39)
(5) operational systems design R & D (P.I.S. 37)

Information Services: - AES historical and climatological meteorological data
- AES internal publications and MSRB Quaterly Reports

Publications: Publications reported in Canadian Geophysical Bulletin

Agency: NATIONAL HYDROLOGY RESEARCH INSTITUTE
NORTHERN HYDROLOGY SERVICE
Surface Water Division
Environment Canada
Ottawa, Ontario
K1A 0E7

Contact: J.C. Anderson Telephone: 819-997-2385
A.C.D. Terroux 819-997-2519
S. Bigras 819-997-2369
819-997-2476

Objectives: Responsibility: water resources research, inland waters

Areas of Hydrology
Expertise: Fluvial geomorphology
Climatology
Remote sensing

Current (a) Northern Highways Hydrology Study
Projects; (Inuvik - Tuktoyaktuk portion of Mackenzie Highway)
(P.I.S. 63)
(b) Ice Regime, lower Mackenzie River and Mackenzie Delta
(P.I.S. 62)
(c) Lake Regimes, Mackenzie Delta (P.I.S. 61)

Information Primarily as study reports
Services:

Publications: Anderson, J.C. (1980). "Hydrologic studies in the Mackenzie Delta Region, N.W.T., 1979". Internal report for the Northern Roads Environmental Working Group, DIAND, Ottawa, 39 p. & appendix.

Agency:

CANADIAN WILDLIFE SERVICE
(a) Seabird Research Unit
Canadian Wildlife Service
Environment Canada
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
B2Y 4A2

(b) Canadian Wildlife Service
Migratory Birds Branch
Environment Canada
Ottawa, Ontario
K1A 0E7

(c) Canadian Wildlife Service, Atlantic
Environment Canada
P.O. Box 1590
Sackville, New Brunswick
EOA 3C0

Contact:

(a) Dr. R.G.B. Brown Telephone: 902-426-2578
Dr. D.N. Nettleship 902-426-3274

(b) Dr. A.J. Gaston 819-997-1841

(c) Dr. A.J. Erskine 506-536-3025

Objectives:

To develop a seabird data base in eastern Canada to allow resource managers to make informed estimates and predictions of the impacts of industrial and resource development activities on populations of seabirds.

Areas of
Expertise:

Distributions of birds at sea; surveys of colonial nesting seabirds; ecology and analyses of seabird populations in the following areas: Devon Island, Prince Leopold Island, Lancaster Sound, Jones Sound, Baffin Island and Baffin Bay, Davis Strait, Hudson Strait, Labrador Sea and the western North Atlantic.

Current
Projects:

(a) Seabird population studies in Lancaster Sound and vicinity (P.I.S. 67)
(b) Hudson Strait Seabird Study - year 2 of 3 (P.I.S. 66)

Information
Services
and
Publications:

(a) Seabird Report List. March 1981. Investigations associated with the program "Studies on Northern Seabirds" by - Seabird Research Unit.

(b) Canadian Wildlife Service
Environment Canada
Ottawa, Ontario
K1A 0E7
for CWS Manuscript Reports

(c) Environment Canada Library, Ottawa for most other
publications.

Agency: ENVIRONMENTAL PROTECTION SERVICE (EPS)
Environment Canada
Room 225, Federal Building
Whitehorse, Yukon
Y1A 2B5

Contact: Telephone: 403-667-6487

Objectives: Responsibilities and Objectives include:

3.1 Legislative Base:

The EPS legislative base includes the Clean Air Act, the Canada Water Act, the Environmental Contaminants Act, the Ocean Dumping Control Act, the Motor Vehicles Safety Act and the Canada Shipping Act, and the pollution control provisions of the Fisheries Act.

The responsibilities of EPS in Yukon are:

- Ocean Dumping
- Environmental Emergency
- Water Pollution Control
- Air Pollution Control
- Ecological Impact Control
- Solid Waste Management
- Federal Activities
- Environmental Contaminants Control

EPS fulfills these responsibilities using methods varying from the enforcement of legislation to advising other Federal Government departments and the Territorial Government on the enforcement of their legislation and by reacting to various non-government organizations and interest groups on queries related to all aspects of environmental protection.

3.2 Advisory Capacity:

EPS staff apply their technical and scientific expertise to the solution of problems that are addressed to a variety of committees and boards in Yukon. Some of the most significant of these are:

- Land Use Advisory Committee (LUAC)
- Arctic Waters Advisory Committee (AWAC) (Yellowknife, NWT)
- Federal Interdepartmental Coordinating Committee (FICC)
- Advisory Committee on Northern Development (ACND) - through headquarters
- Yukon Territory Water Board (YTWB)

Areas of
Expertise:

Staff from the Yukon EPS office have participated in the Arctic Marine Oil Spill Program (AMOP) and have acted as scientific authority on a consultant-produced report titled "Oil Debris Disposal and Storage Sites: Beaufort Sea Coast". This report has subsequently been published as Economic and Technical Review Report EPS 3-EC-79-3.

Currently, staff are preparing to participate in the Baffin Island Oil Spill (BIOS) program so as to further the ability of the Yukon office to respond appropriately if a spill occurs within the regional boundaries off the Yukon coast.

The Yukon EPS office has resident staff with backgrounds in fisheries, biology, chemistry and engineering, supported by a Regional office staff of experts in marine and freshwater biology, chemistry, engineering and emergency spill response.

Current
Projects:

Participation in AMOP (P.I.S. 51)
A limited shore-based investigation of water quality is planned for the 1981 season.

It is anticipated that in 1982 the Pacific and Yukon Region of EPS will undertake terrestrial and marine studies along the north coast and in the Beaufort Sea, particularly as related to potential harbour sites, such as King Point. These studies may be jointly conducted with the Northwest Region.

Information
Services:

A small library is being developed for "in house" use on all aspects of EPS Yukon activities and includes available information on the Beaufort Sea proposals that is relevant to EPS activities.

Publications: None specifically generated from Yukon EPS office.

Agency: ATMOSPHERIC ENVIRONMENT SERVICE - CENTRAL REGION
Room 1000
266 Graham Avenue
Winnipeg, Manitoba
R3C 3V4

Contact: G. Barrie Atkinson (CAESE) Telephone: 204-949-6059

Objectives: For Central Region north of 60 degrees, responsibilities are:
a) environment assessment and consultation with respect to meteorological matters, including air quality and atmospheric dispersion, and ice;
b) operation of meteorological data acquisition networks, both surface and aloft, at a specified network density.

For Central Region south of 60 degrees, responsibilities are both of the above, and in addition, provision of meteorological forecasts and warnings.

Areas of Expertise: Areas of expertise are as indicated under "objectives".

Current Projects: No projects relevant to the Beaufort Sea Proposal have been undertaken by Central Region, AES.

Information Services: An internal library of reference material is maintained. This is available to other agencies and the public on a limited basis. A climatological database is maintained for a limited number of types of meteorological observations.

Publications: None relevant north of 60 degrees.

Agency: ATMOSPHERIC ENVIRONMENT SERVICE
ARCTIC METEOROLOGY SECTION
Applications and Impact Division (CCAI)
Canadian Climate Centre (CCC)
4905 Dufferin Street
Downsview, Ontario M3H 5T4

Contact: J.B. Maxwell Telephone: 416-667-4550
Superintendent
Arctic Meteorology Section.

Objectives: Responsible for the national program of meteorological applications and impacts, and consultation related to the Arctic.

Areas of Expertise: (i) Regional climate - Beaufort Sea, Arctic Islands, Lancaster Sound - Baffin Bay - Davis Strait, Mackenzie Valley
(ii) Climatic data relevant to engineering design
(iii) Climate as a factor in environmental impact assessment
(iv) Meteorological observations of relevance to the Beaufort Sea Hydrocarbon Production Proposal and held in the CCC archives.

Current Projects: (i) Regional climate study of Canadian Arctic Islands and adjacent Waters. (P.I.S. 32)
(ii) Climate study of northwestern Baffin Bay. (P.I.S. 31)
(iii) Offshore wind/wave climate studies. (P.I.S. 30)
(iv) Air temperature study relevant to steel selection for ship hulls. (P.I.S. 33)
(v) Climatic change in the Arctic. (P.I.S. 34)

Information Services: (i) Provide access to national archive of climatic data
(ii) Provide access to national meteorological library - texts, journals, reports, bibliographic service.

Publications: (i) Contributor to Applications and Impact Division's quaterly reports
(ii) Contributor to annual report "Government Activities in the North"

Agency: PARKS CANADA
NATIONAL PARKS BRANCH
Ottawa, Ontario
K1A 1G2

Contact: John A. Carruthers Telephone: 819-994-3011
National Parks System Division

Objectives: Parks Canada has a mandate to select and establish National Parks, National Historic Parks, Canadian Landmarks, and A.R.C. areas.

Current Projects: North of 60° there has been a great deal of work done to identify Natural Areas of Canadian Significance (NACS, areas from which potential national parks are selected), and work is now commencing to identify Natural Sites of Canadian Significance (NSCS, from which Canadian Landmarks will be selected).

Work is ongoing to prepare detailed data sheets and maps on the NACS areas north of 60°. Seven of the areas fall within the Beaufort Sea region. Many of the other areas could be affected by pipeline or marine transportation of hydrocarbons.

Publications: Parks Canada, National Parks Branch. February 1981. Progress report on the National Parks Interests in the Yukon and the Northwest Territories.

Parks Canada, Parks System Planning Division. In preparation. Parks Canada input to the Department of Environment Conservation Land Strategy for Northern Canada.

Parks Canada, Parks System Planning Division. 1979. A Regional analysis of Natural Region 10, the Mackenzie Delta, 1979.

Boreal Institute for Northern Studies 1980. Regional analysis of Natural Region 36, Western Arctic Lowlands

Woodward and Clyde Associates. In preparation. Regional analysis of Region 4, the Western Arctic Marine Region.

Agency: WATER POLLUTION CONTROL DIRECTORATE
NORTHERN TECHNOLOGY UNIT
Environment Canada
804, 9942 - 108 Street
Edmonton, Alberta T5K 2J5

Contact: Bryan Armstrong
Project Engineer, Northern Technology Unit

Objectives: The Northern Technology Unit (N.T.U.) is a program of national scope within the Technology Development Branch of the Water Pollution Control Directorate with activities directed in the areas north of 60°, as well as the northern provinces.

The N.T.U. provides assessment and advice; development and demonstration of appropriate and cost-effective water supply and wastewater management technologies; and information supply through technology transfer seminars and publications.

Areas of
Expertise:

Activities of the N.T.U. include:

1. Maintaining an awareness of current and developing infrastructural related technologies as applied to northern areas;
2. Acting as northern technology specialists within the National Water Pollution Program;
3. Providing advice on request to problems of water supply development or wastewater collection, treatment and disposal;
4. Acting as contract supervisors and scientific liaison officers on contracted-out projects;
5. Advising the Wastewater Technology Centre, Burlington, Ontario, on northern pollution abatement problems requiring technology development with particular emphasis on energy related matters;
6. Conducting inhouse and/or joint technology demonstration projects;
7. Implementing technology transfer programs in response to specific northern requirements.

Current
Projects:

- Participation in preparation of the EPS publications - Cold Climate Utilities Delivery Design Manual
- Regional seminars on Northern Utilities Technology
- Public Information Campaign on Water Conservation with the Government of the Northwest Territories
- Evaluation of experiences on the operation and maintenance of shallow buried pipe systems

- State-of-the art of northern lagoon practice
 - GNWT Water and Sanitation Computer Model follow up
 - Technical assistance projects.
- Project Information Sheet 80.

Publications: Northern Technology Unit, May 1980. Information Brochure.

Northern Technology Unit. Papers, Reports and Presentations. July 1975 - April 1981.

Agency: CANADIAN WILDLIFE SERVICE
Western & Northern Region
Environment Canada
#1000, 9942 - 108 Street
Edmonton, Alberta T5K 2J5

Contact: F.L. Miller Telephone: 403-435-7246

Objectives: Research on Arctic Ungulates

Area of Expertise: Inter-island movements of Peary caribou and helicopter harassment of Peary caribou and muskoxen

Current Projects: (1) Helicopter harassment of Peary caribou and muskoxen (P.I.S. 59)
(2) Inter-island movements of Peary caribou on the western Queen Elizabeth Islands and the Prince of Wales Island-Somerset Island-Boothia Peninsula complex (P.I.S. 60)

Publications: See project information sheets

Agency: ENVIRONMENTAL EMERGENCY BRANCH
Environmental Protection Service
Place Vincent Massey, 15th Floor
Ottawa, Ontario K1A 1C8

Contact: J.D. Kingham Telephone: 819-997-2037
Director, Environmental Emergency Branch

Objectives: Responsibilities:
EPS helps develop contingency plans for oil spills and other accidents involving hazardous materials. This involves coordination of technology and advice on spill prevention. EPS alerts appropriate agencies, reports on environmental emergencies, ensures adequate cleanup measures are taken, and, where necessary, initiates cleanup.

Projects: The Environmental Emergency Branch conducts a large number of studies relevant to the information survey. The major studies are part of the Arctic Marine Oilspill Program (AMOP). (See Project Information Sheet 28 for listing).

Information Services: Publications of the Environmental Emergency Branch,
Environmental Impact Control Directorate.

EE Publication Series.

Publications: Selected publication from the above lists:

<u>Publications</u>	<u>Number</u>
A Selected Bibliography on the Fate and Effects of Oil Pollution Relevant to the Canadian Marine Environment	EPS-3-EC-80-5
Thin Oil Film Detection Limits of Laser Fluorosensors	EPS-4-EC-80-3
Microwave Systems for Detecting Oil Slicks in Ice-Infested Waters: Phases II and III	EPS-3-EC-80-3
Characteristics of Atmospheric Emissions from an In-Situ Crude Oil Fire	EPS-4-EC-79-1
Spill Technology Newsletter Volume 4 - 1979	EPS-3-EC-80-1

A Review of Oil Slick Combustion Promoters	EPS-3- <u>G4-13.1</u> EC-79-8
Feasibility of Surface Detection of Oil Under Ice	EPS-3-EC-79-11
Evaluation of Pumps and Separators for Arctic Oil Spill Cleanup	EPS-4-EC-79-3
Spill Technology Newsletter Volume 3 - 1978	EPS-3-EC-79-1
Theory, Development and Testing of an Ice-Oil Boom	EPS-4-EC-79-2
Testing of Air-Deployable Incendiary Devices for Igniting Oil on Water	EPS-4-EC-78-11
Arctic Oil Spill Countermeasures Logistics Study: Analysis Report	EPS-3-EC-78-9
Arctic oil Spill Countermeasures Logistics Study: Summary Report	EPS-3-EC-78-8
Review of Ice Movement Buoys for Tracking oil Spills	EPS-3-EC-78-7
Probabilities of Blowouts in Canadian Arctic Waters	EPS-3-EC-78-12
Selection Criteria and Laboratory Evaluation of Oil Spill Sorbents: An Update	EPS-4-EC-78-8
The Impact & Cleanup of Oil Spills on Canadian Shorelines: A Summary	EPS-6-EC-78-1
The Interaction of Crude Oil and Natural Gas with Laboratory-Grown Saline Ice	EPS-4-EC-78-9
Performance Assessment of Test Liners for Petroleum Product Storage Areas in Northern Canada	EPS-4-EC-78-6
Field Evaluation of Eight Small Stationary Skimmers	EPS-4-EC-78-5
Field Evaluation of the Super Seahawk and Marco Class V Oil Skimmers	EPS-4-EC-78-2
Pumps for Oil Spill Cleanup	EPS-4-EC-78-3
A Selected Bibliography on Oil Spill Dispersants	EPS-3-EC-78-2

A Selected Bibliography on Oil Spill Dispersants	<div>G4-13.2</div> <div>EPS-3-EC-78-2</div>
Spill Technology Newsletter Volume 2 - 1977	EPS-3-EC-78-1
Field Evaluation of Oil Spill Recovery Devices: Phase Two	EPS-4-EC-77-14
Assessment of Rigid Urethane Foams as Liners for Petroleum Product Storage Areas in Northern Canada	EPS-4-EC-77-13
A Selected Bibliography on the Fate and Effects of Oil Pollution Relevant to the Canadian Marine Environment	EPS-3-EC-77-23
Field Evaluation of Oil Mop and Preheat Unit	EPS-4-EC-77-12
Mathematical Model of the Behaviour of Oil Spills on Water with Natural and Chemical Dispersion	EPS-3-EC-77-19
A Field of the Permeability of Multiyear Ice to Sea Water with Implications on its Permeability to Oil	EPS-4-EC-77-11
The Feasibility of Oil Spill Dispersant Application in the Southern Beaufort Sea	EPS-3-EC-77-16
Novel Countermeasures for an Arctic Offshore Well Blowout	EPS-3-EC-77-14
Probable Behaviour and Fate of a Winter Oil Spill in the Beaufort Sea	EPS-4-EC-77-5
Methods used by Environment Canada in the Testing of Oil Spill Dispersants	EPS-4-EC-77-6
Coastal Environments of Canada: The Impact and Cleanup of Oil Spills	EPS-3-EC-77-13
A Study of Spray-on Liners of Petroleum Product Storage Areas in the North	EPS-4-EC-77-2
Spill Technology Newsletter Volume 1 - 1976	EPS-3-EC-77-11

An Oil Spill Bibliography March, 1975 to December, 1976	<u>G4-13.3</u> EPS-3-EC-77-10
Oil Spill Countermeasures for the Southern Beaufort Sea	EPS-3-EC-77-6
Oil Spill Countermeasures of the Southern Beaufort Sea: Appendix (to Report EPS-3-EC-77-6)	EPS-3-EC-77-7

<u>List of EE Publications</u>	<u>Number</u>
Oil and Dispersants in Canadian Seas - Research Appraisal and Recommendations	EE-1
The Sublethal Effects of Physically and Chemically Dispersed Crude Oil on the Physiology and Behaviour of the Estuarine Isopod <u>GNORIMOSPHAEROMA OREGONENSIS</u>	EE-2
Investigation of the Overflow and Loss of Petroelum Fuel at Storage Facilities	EE-3
A Bibliography on the Remote Sensing of Oil Pollution	EE-4
A Study to Evaluate the Combustibility and Other Physical and Chemical Properties of Aged Oils and Emulsions	EE-5
Theoretical Assessment and Design Study of the Aerial Application of Oil Spill Dispersants	EE-6
A Mathematical Model of Oil Spill Behaviour	EE-7
Oil Spill Processes and Models	EE-8
Study of Application and Suitability of Hazard/Risk Analysis Methodology for Environmental Considerations	EE-9
An Economic Evaluation of a Mobile Rotary Kiln Designed for the Cleanup of Oil Comtaninated Beaches	EE-10
Theoretical Study for the Scale Modelling of Subsea Containment Devices	EE-11
A Study of the Combustibility of Weathered Crude Oils and Water-In-Oil Emulsions	EE-12

The Physical Properties of Fresh and Weathered Crude Oils	EE-13	<u>G4-13.4</u>
A Study of the Combustibility of Weathered Crude Oils and Water-In-Oil Emulsions	EE-12	
The Physical Properties of Fresh and Weathered Crude Oils	EE-13	
Evaluation and Prevention of Corrosion Leaks on Buried Storage Tanks	EE-14	
An Oilspill in Pack Ice	EE-15	

Agency: ENVIRONMENTAL PROTECTION SERVICE
NWT District Office
Dept. of Environment
P.O. Box 370
Yellowknife, NWT

Contact: Sandra Desjardins Telephone: 403-873-3456

Objectives: Responsibilities in the Beaufort Sea:

(1) Administer the Ocean Dumping Control Act and process all permits. Chair the Regional Ocean Dumping Advisory Committee (RODAC). This involves liaising with OGD's, industry and public interest groups on ocean dumping matters, Coordination of Ocean Dumping research for the Western and Northern region and advising on ocean dumping scientific studies. Inspections of all dump sites in Arctic Waters are carried out.

Liaison with OGD's to ensure consistency in government regulatory requirements on Arctic Waste dumping activities.

(2) In co-operation with the Regional EPS Office we are responsible for developing "action plans" for the spill surveillance and technical advise teams as part of the Government Contingency Plan-Arctic Seas. EPS Yellowknife is also responsible for responding to environmental emergencies in the NWT in cooperation with GNWT, MOT and DIAND. This response can vary from information gathering, alerting service, on site monitoring, documentation, prosecutions and follow-up actions.

(3) participation on AWAC-developing environmental operating conditions for activities in Arctic waters.

(4) Energy Development Inspection Program. EPS has one inspector that carries out complete inspections of all Beaufort Sea Operations including drillships, McKinley Bay, Tuk Base and Tuk Harbour. This inspection program is coordinated through DIAND.

Areas of Expertise: Areas of Expertise relevant to the assessment of Beaufort Sea Proposal

- (1) Ocean Dumping Control Officer
- (2) 1 energy systems technician - spills
- inspections
- (3) 3 marine biologists and 1 marine technician.

Current Projects: (1) Beaufort Sea Dredging Project management. A joint government/industry multiagency program which EPS is coordinating to determine effects of large scale dredging projects in the Beaufort.

(2) Ocean Dumping Sampling Method Standardization - to statistically determine the effects of sample size, sampling pattern and sampling device on the analysis of sediment samples for ODCA requirements, to establish guidelines for sampling methods.

(3) Dispersant Preparedness - develop expertise and formulate operating procedures for the use of dispersants in the event of a major oil spill in Arctic Waters. This will enable the district EPS staff to deliver scientifically valid advice on dispersant use in a timely and efficient manner, should the need arise.

(4) Beaufort Sea Region Coastal Zone Assessment - to compile information on the abundance and distribution of various marine resources, assess resources which are rare, unique and sensitive and contribute information to AWAC and RODAC for development planning and the assessment of probable environmental impacts. This will complement the already existing Oil Spill Contingency plan inventory. This program will assist government in deciding where to designate shoreline development areas in terms of environmentally sensitive areas where no development should take place.

(5) Participation in BIOS technical committee and the shoreline clean-up program at Cape Hatt.

See Project Information Sheets 126-128

Information
Services:

A technical reference library is available in the NWT district office on the 9th floor of the Bellanca Building. Any requests for using the library should be directed to Sandra Desjardins.

Publications:

- A weekly offshore situation report is prepared in this office every week summarizing the latest developments and news regarding offshore areas of NWT. This report focuses mainly on the Beaufort.
- As the above current programs are all new this year, publications will not be available until 1982. No previous Beaufort Sea work on projects has been published.
- Inspection reports of energy developments are prepared after each inspection and an annual report of all inspections is prepared.

Agency: FEDERAL ENVIRONMENTAL ASSESSMENT REVIEW OFFICE
200 Sacré-Coeur Blvd
Hull, Quebec
K1A 0H3

Contact: J.S. Klenavic Telephone: 819-997-1000

Objectives: The Federal Environmental Assessment Review Office (FEARO) is responsible for and administers the Environmental Assessment and Review Process (EARP) on behalf of the Minister of the Environment.

FEARO is responsible for producing policy and for providing guidelines, procedures and administrative advice to participating agencies and to the public on the operation of the process.

The Executive Chairman of the office establishes the separate Environmental Assessment Panels to review potential environmental consequences of referred projects, programs and activities. The Executive Chairman, or his delegate, chairs each panel. The Executive Chairman appoints the Executive Secretary for each panel and provides staff support for panel activities. Once established, however, all Environmental Assessment Panels are independent bodies that report their findings directly to the Minister of the Environment.

Current Projects: Current or Recently Completed (1979) Panel Projects (Northern):
Alaska Highway Gas Pipeline Project
Arctic Pilot Project (Northern Component)
Beaufort Sea Hydrocarbon Development
Eastern Arctic North Shore Drilling - North Davis Strait Project
Lancaster Sound Offshore Drilling Project, N.W.T.
Norman Wells Oil Field Development and Pipeline.
See Project Information Sheet 200 for more information.
(Reference - Register of Panel Projects Number 15, Sept. 1981. FEARO)

<u>Publications:</u>	TITLE	FEARO DISTRIBUTION NO.
	A Revised Guide to the Federal Environmental Assessment Review Process.	14
	Guidelines for preparing Initial Environmental Evaluations	25
	A Guide for Environmental Screening	13

Environmental Assessment Panels - What They Are - What They Do.	27
Environmental Assessment Panels - What They Are - What They Do. (Eastern and Western Inuktituk Translation)	59
The Assessment and Review of Social Impacts By Reg Lang and Audrey Armour. March, 1980.	65
Ecological Land Survey Guidelines for Environmental Impact Assessment Ecological Land Classification Series No. 13 Lands Directorate and FEARO.	60
Detailed Outline of Contents of Cabinet Memoranda Establishing the Federal Environmental Assessment Review Process	26
Register of Panel Projects and Bulletin. (Quarterly).	
Guidelines for the preparation of Environ- mental Impact Statements published individually for each project.	
<u>PANEL REPORTS TO THE MINISTER OF THE ENVIRONMENT:</u>	
Alaska Highway Gas Pipeline, July, 1977	3
Shakwak Highway, June, 1978.	5
Eastern Arctic Offshore Drilling - South Davis Strait, February, 1979.	6
Lancaster Sound Offshore Drilling, February, 1979.	7
Alaska Highway Gas Pipeline, August, 1979.	10
Arctic Pilot Project, Northern Component, October, 1980	234
Norman Wells Oilfield Development, January, 1981.	263

Agency: ECONOMIC POLICY & MARKETING
Fisheries and Oceans
240 Sparks St., Ottawa, Ontario

Contact: H. Rae Grinnell Telephone: 613-995-2130

Objectives: Socio-Economic objectives, fishing and the fishing industry.

Areas of Expertise: Economic

Projects: No specific projects related to the Beaufort Sea.

Information Services: Fisheries and Oceans Library
240 Sparks St., 8th Floor West
Ottawa, Ontario K1A 0E6

Publications: A Socio-Economic Overview: The Implications for Atlantic Fisheries of Offshore Petroleum Development.

Agency: ARCTIC BIOLOGICAL STATION
Department of Fisheries and Oceans
555 St. Pierre Boulevard
Ste. Anne de Bellevue, Que. H9X 3R4

Contact: Dr. A. W. Mansfield, Director Telephone: (514) 457-3660

Objectives:

1. To provide information on the distribution, abundance and ecological and physiological relationships of arctic marine biota for environmental impact assesment and resouce management.
2. To provide information for management on the distribution, abundance, feeding, growth, reproduction and predation of arctic seals and whales. To study their relation to the arctic marine ecosystem, particularly with respect to their ability to tolerate possible environmental disturbance, resulting from exploitation of resources such as fossil hydrocarbons and minerals.
3. To provide information on the distribution, abundance and ecological relationships of the more important species of marine and anadromous fish for resource management and environmental impact assesment.

Areas of Expertise:

Bunch, J.N.	Arctic Microbiology
Grainger, E.H.	Arctic Marine Zooplankton
Hsiao, S.I.C.	Arctic Marine Phytoplankton, Productivity
Hunter, J.G. (retired)	Arctic Marine Fisheries Ecology
Mansfield, A.W.	Arctic Marine Mammal Ecology
Mitchell, E.D.	Arctic Whale Ecology
Percy, J.S.	Physiology of Arctic Marine Invertebrates
Sergeant, D.E.	Arctic Whales
Smith, T.G.	Arctic Seal Population Dynamics and Ecology
Wacasey, J.W.	Invertebrate Systematics, Distribution and Abundance, Arctic Zoobenthic Ecology

Current Projects;

One current program--'Microbiology of water and sediments at Issungnak artificial island.' (P.I.S. 55)

Information

Services:

Small library specializing in marine mammals, marine ecology and the arctic.

Data from over 30 years studies on arctic aquatic ecosystems has been published or is being worked up. Accessibility is variable, depending on program.

Publications: No annual report available.

Publications lists for individual authors available on request.

Agency: SCIENTIFIC INFORMATION AND PUBLICATIONS BRANCH
240 Sparks Street,
7th Floor West
Ottawa, Ontario K1A 0E6

Contact: Telephone: 613-996-2372

Objectives: Publication and creation of computer searchable databases on aquatic sciences and fisheries information in Canada.

Areas of Expertise: Ongoing and published R&D activities in the aquatic sciences and fisheries sector in Canada.

Current Projects: not applicable

Information Service: Various publications series of the Branch.
Canada's contribution to the Aquatic Sciences and Fisheries Abstracts database and DFO input to the Canada Environment database, both made publicly available in Canada by QL Systems Ltd.

Publications: See the indexes available through DSS Publishing Centre for all publications produced since 1901.

Agency: MARINE ENVIRONMENTAL DATA SERVICES BRANCH
240 Sparks Street
7th Floor West
Ottawa, Ontario K1A 0E6

I. OCEAN WAVE DATA BASE

Contact: R. Keeley Telephone: 613-995-2011
Ocean Data Base

Objectives: Archival and analyses of historical physical oceanographic data (OCEANS)

Area of Expertise: Oceanography

Information Services: On-line System 2000 databases of historical NANSEN BOTTLE, BATHYTHERMOGRAPH and CTD-STD observations accessible through DATAPAC phone lines.

Publications: Included in:
Annual Reports - Marine Environmental Data Service.
Publication Index. April 1981. Marine Environmental Data Service.

II. CANADIAN MARINE DATA INVENTORY

Contact: H. Jones Telephone: 613-995-2007

Areas of Expertise: Data Management

Information Services: On-line System 2000 database of Canadian Marine Data Inventory information of data recorded within the Canadian Area of Interest and accessible through DATAPAC phone lines.

Publications: Included in:
Annual Report. Marine Environmental Data Service.
Publications Index. April 1981. Marine Environmental Data Service.

III. WATER LEVEL DATA BASE

Contact: A. Bolduc Telephone: 613-995-2007

Area of Expertise: Tidal Analyses

Information Services: Magnetic tape files of historical in situ tides and water level observations. A special Tidal Acquisition and Telemetry System maintaining 15-minute water level observations of the Great Lakes and three tide gauges for on-line access via phone lines. On-line System 2000 database of last two years of tides and water level data presently under processing.

Publications: Included in:
Annual Reports - Marine Environmental Data Service
Publication Index. April 1981. Marine Environmental Data Service.

IV. SURFACE WAVE DATA BASE

Contact: R. Wilson Telephone: 613-995-2007

Objectives: Collection, data processing, and archival of in situ wave observations in the Canadian Area of Interest including the Beaufort Sea (WAVES)

Current Projects: In-situ wave measurements in Beaufort Sea in conjunction with exploration by Dome Petroleum. (P.I.S. 56)

Information Services: Magnetic tape files of in-situ waverider observations of both digital and spectral information. Standard booklets and special analyses available on request.

Publications: Included in:
Annual Reports - Marine Environmental Data Service
Publication Index, April, 1981. Marine Environmental Data Service.

Agency: ATLANTIC OCEANOGRAPHIC LABORATORY
Department of Fisheries and Oceans
Ocean and Aquatic Sciences, Atlantic
Bedford Institute of Oceanography
Dartmouth, Nova Scotia

Contact: Dr. G.T. Needler Telephone: 902-426-7456
Director

Objectives: The Atlantic Oceanographic Laboratory (AOL) carries out pure and applied research in the fields of physical and chemical oceanography in waters bordering the eastern and northern shorelines of Canada. It is also involved in the research and development of new instrumentation and methods of data acquisition. It is linked both physically and scientifically with other laboratories housed at the Bedford Institute of Oceanography which undertake research in marine ecology, marine geology and geophysics, and hydrographic surveys. Projects of the Atlantic Oceanographic Laboratory are supported by in-house capability in the fields of mechanical and electrical engineering and computer technology.

The Laboratory's general objectives are to gain understanding of the physical and chemical nature of the marine environment; to identify and investigate those processes that are important in the management of the environment and of which our knowledge is inadequate; to respond to requests for specific advice from government, industry, etc.; to contribute to ocean information services; and to act as a centre for research in physical and chemical oceanography in eastern Canada, comparable to major oceanographic institutions abroad, and complementary to the efforts in Canadian universities.

Area of Expertise: There are four divisions, namely, Ocean Circulation, Coastal Oceanography, Chemical Oceanography and Metrology. Work in either of these divisions would have an impact on the present offshore development and exploration of the seas.

Projects: Physical Oceanography Program: (P.I.S. 25)
Surface and Mixed-Layer Oceanography
Atmospheric Fluxes
 - Arctic Polyna Experiment
 - Beaufort Sea Heat Budget
 - Wave Climate Studies
 - Oil Trajectory Analysis
 - Iceberg Drift Track Prediction.
Comprehensive Surveys
Satellite Data

Chemical Oceanography Program

Marine Pollution Chemistry: (P.I.S. 26)

- Chlorinated Hydrocarbons
- Dissolved Low Molecular Weight Hydrocarbon
- Petroleum Hydrocarbon Components
- Petroleum Residues in the Eastern Canadian Arctic.

Information Services:

Those of the Bedford Institute of Oceanography.

Publications: Selected recent Publications include:

Bugden, G.L. The deformation of pack ice by ridging. Journal of Geophysical Research, 84, 1793-1796, 1979.

Campbell, J.A. and P.A. Yates. The distribution of Mn, Fe, Ni, Cu and Cd in the waters of Baffin Bay and the Canadian Arctic Archipelago. Deep-sea Research, in press.

Jones, E.P. and A.R. Coote. Nutrient distribution in the Canadian Archipelago: Indicators of summer water mass and flow characteristics. Journal of Fisheries and Aquatic Sciences, 37, 588-599, 1980.

Jones, E.P. and E.M. Levy. Fossil fuel CO₂ buildup in Baffin bay. Presented at CMOS/AGU Spring Meeting. Abstract only, EOS, 61, No. 17, 275, 1980.

Jones, E.P. and E.M. Levy. Fossil fuel CO₂ buildup in Baffin Bay. Journal of Marine Research, in press.

Levy, E.M. Background levels of petroleum residues in Baffin Bay and the Eastern Canadian Arctic: Role of Seepage. Invited Paper Petromar 80, International Conference and Exhibition Petroleum in the Marine Environment, Monaco, May, 1980, in press.

Levy, E.M. Further Chemical Evidence for Natural seepage on the Baffin Island shelf. Current Research part 3., Geological survey of Canada. Paper 79-1B, 379,383, 1979.

Levy, E.M. Transfer processes and the Global distribution of petroleum pollution in the marine environment. Invited paper, LAPSO Symposium on Marine Pollutant Processes, XVII IVGG General Assembly, Canberra, Australia, Dec. 1979, Elsevier Oceanography Series, in press.

MacLean, B., R.K.H. Falconer, and E.M. Levy. Geological, geophysical and chemical evidence for natural seepage off the Northeast Coast of Baffin Island. Bulletin of Canadian Petroleum Geologists, in press.

Agency: MARINE ECOLOGY LABORATORY
Department of Fisheries and Oceans
Ocean and Aquatic Sciences, Atlantic
Bedford Institute of Oceanography
Dartmouth, Nova Scotia B2Y 4A2

Contact: Dr. K.H. Mann Telephone: 902-426-3696
Director

Objectives: The Marine Ecology Laboratory undertakes basic research in biological oceanography, with emphasis on gaining a better understanding of marine ecosystems. This understanding is needed for the wise management of oil and gas development on the one hand and the fisheries resource on the other.

Area of Expertise: There are three divisions within the laboratory

The Biological Oceanography Division carries out research into the fundamental processes of primary and secondary production in the water column. Studies are carried out in all kinds of situations, from the Arctic to the tropics, but most attention is focussed on the Eastern Arctic and the Canadian continental shelves.

The Fisheries Oceanography Division is concerned with the factors influencing fish production: environmental factors, biological interactions and the management of the fishery industry. The long-term goal is to improve our ability to make predictions useful to the fishing industry.

The Environmental Quality Division is concerned with the changes that take place in marine organisms and ecosystems as a result of chemical contamination, or of major engineering works, such as dams and barrages.

Projects: Biological Oceanographic Division:
Eastern Arctic Ecological Studies

Information Services: Those of the Bedford Institute of Oceanography.

Publications: Selected Recent Publications:
Referred:
Brodie, P.F. In press. Density dependent condition and energetics of marine mammal populations in multi species fisheries management. Can. J. Fish. Aquat. Sci.

Campbell, J.A. and D.H. Loring. In press. Baseline levels of heavy metals in the waters and sediments of Baffin Bay. Marine Pollution Bulletin.

Nemoto, T., and G. Harrison. In press. High latitude ecosystems. In Analysis of Marine Ecosystems (ed.) A.R. Longhurst, Academic Press, London.

Sprague, J.B., J.H. Vandermeulen, and P.G. Wells. In press. Oil and dispersants in Canadian seas - Recommendations from a research appraisal. Marine Pollution Bulletin.

Irwin, B., W.G. Harrison, C.L. Gallegos, and T. Platt. In press. Phytoplankton productivity experiments and nutrient measurements in the Labrador Sea, Davis Strait, Baffin Bay, and Lancaster Sound from 26 August to 14 September 1978. Can. Data Rep. Fish. Aquat. Sci. No. 213, 103 pp.

Other

Brodie, P.F. In press. A preliminary investigation of the energetics of the Bowhead Whale (*Balena mysticetus* L.). Presented at the International Whaling Commission Scientific Meetings July 1980.

Brodie, P.F. Recent history and present status of the white whale in Cumberland Sound, Baffin Island. Presented at CAFSAC, May 1980.

Brodie, P.F., J.L. Parsons, and D.E. Sergeant. In Press. Present status of the white whale (*Delphinapterus leucas*) in Cumberland Sound, Baffin Island. Presented at the International Whaling Commission scientific meetings, July 1980.

Sprague, J.B., J.H. Vandermeulen, and P.G. Wells. Editors. 1980. Oil and dispersants in Canadian Seas - Research Appraisal and Recommendations. Environment Canada, EPS, 182 pp.

Trites, R.W. 1980. The fate of oil spilled at sea. Paper given at Oil and Natural Gas Offshore Development Seminar 27-29 January, Halifax, N.S.

Vandermeulen, J.H. 1980. Oilspills: What have we learned? In Oil and Dispersants in Canadian Seas - Research Appraisal and Recommendations. (Sprague, J.B. et al. eds). Environment Canada.

Agency: DEPARTMENT OF FISHERIES AND OCEANS, WESTERN REGION
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Contact: Mr. J.S. Loch Telephone: 204-269-7379

Objectives:

- a) Research and management of Arctic fish and marine mammal resources.
- b) Acquisition of new knowledge of habitat (of fish and marine mammals), problems of a chemical nature, that are of national significance.
- c) Enhancement and rehabilitation of fish resources depleted by over-exploitation or habitat disruption.
- d) Fish quality improvement.

Areas of Expertise:

- a) Fish populations and dynamics and general ecology
- b) Analytical chemistry (of water)
- c) Hydrology
- d) Toxicology
- e) Marine mammal studies
- f) Management of fisheries (including marine mammals)
- g) Zooplankton
- h) Phytoplankton
- i) Fish physiology
- j) Heavy metal pollution/effects
- k) Primary production
- l) Fish production
- m) Fish pathobiology

Current Projects:

- (1) Review and assessemnt of existing data for fish and marine mammals in the Beaufort Sea hydrocarbon production area and along possible transportation corridors.
- (2) Data inventory of bowhead and white whales in the Beaufort Sea and adjacent marine waters.
- (3) Water quality monitoring in Tuktoyaktuk Harbour
- (4) Coastal migrations: Spawning Areas
- (5) Heavy metal and Hydrocarbon monitoring in sediments and fishes along the Tuktoyaktuk Peninsula.
- (6) Metals in Arctic ecosystems
- (7) Energy related organics
- (8) Subsidence beluga/narwhale exploitation - Mackenzie Delta and Baffin area.

(9) Tuktoykatuk Lakes study

(10) Mackenzie Delta - Beaufort Sea Project

(11) Monitoring and Assessment of the commercial fishery potential in the Mackenzie Delta.

Project Information Sheets 129-139

Information
Services:

Library

Publications:

See indices to publications of the staff of the Freshwater Institute, Fisheries and Marine Service, Technical Reports #'s 505, 620, 764 and ? (in press).

Agency: DEPT. OF FISHERIES AND OCEANS
CENTRAL REGION, OCEAN SCIENCE AND SURVEYS
Research and Development Division
867 Lakeshore Road
Burlington, Ontario L7R 4A6

Contact: Dr. S.J. Prinsenbergh Telephone: 416-637-4380
A/Division Chief

Objectives: Objectives specifically related to Beaufort Sea
Production include:

- to document the magnitude of short and long-term variations in the physical, chemical, and biological properties of the water in a section of the Northwest Passage.
- to develop long-term measurement and mooring capability for collecting oceanographic data in the Canadian high-Arctic such as the Gyroscope Unmanned Profiling System.
- to develop an understanding of the interaction of low incident angle radar signals with sea ice such that a classification of ice type can be carried out from a surface vessel at ranges of 5-6 miles.
- to continue ongoing monitoring oceanographic parameters in Hudson and James Bays to assess the effects of man-made changes to seasonal run-off on the circulation and biological regimes of the bays.

Areas of Expertise:

- Physical and Biological Oceanography
- Oceanographic Instrumentation Development
- Oceanographic Technical Operations
- Ice Radar

Current Projects:

- i) Oceanographic Monitoring in Barrow Strait (P.I.S. 115)
- ii) G- UMPS, Gyroscope Unmanned Profiling System (P.I.S. 117)
- iii) Ice Radar (P.I.S. 116)
- iv) Hudson and James Bay oceanographic monitoring (P.I.S. 118)

Information Services: Information is accessible through the Division's publication series of Manuscripts, Data Reports and Technical Note Series. A listing of reports relevant to Beaufort Sea Production is provided on the Project Information Sheets (Nos. 115-118).

Data Reports represent hard copy of the processed Arctic data which can also be obtained on computer tape or computer cards.

Publications: See Project Information Sheets (115-118)

Agency: (OCEANOGRAPHIC INFORMATION DIVISION)

Institute of Ocean Sciences

Dept. of Fisheries & Oceans

Sydney, B.C. V8L 4B2

Contact: Dr. A.B. Cornford

Telephone: 604-656-8335

Objectives: The new Oceanographic Information Division functions as a focal point for provision of an oceanographic information service for the Canadian west coast and western arctic in support of management, protection and exploitation of marine resources. This includes input to the Environmental Assessment and Review Process (EARP), numerous committees including the Regional Ocean Dumping Advisory Committees (RODAC), the Arctic Waters Advisory Committee (AWAC) and the DFO Arctic Offshore Development Committee (ARCOD); provision of data, information and advice on a day-to-day basis; and conducting environmental overviews and assessments serving as guides to regulatory agencies, industry and future research initiatives. The division will also provide oceanographic data products, some of which will be catalogued in the Marine Environmental Data Service (MEDS) in Ottawa including climatological atlases as well as real time products such as sea surface temperature when warranted. The role of media relations for IOS is being enhanced to ensure that adequate communication and feedback is achieved with our clients. The division will also continue to provide program analysis and policy planning support to the Director General of Ocean Science and Surveys, Pacific Region.

Areas of Expertise: Environmental Services is responsible for the management and/or conduct of specific marine environmental reviews or environmental quality research projects designed to meet specific purposes.

Current Projects: Beaufort Sea Studies. (P.I.S. 14)

Review and Assessment of existing data for marine science disciplines in the Beaufort Sea hydrocarbon production area. (P.I.S. 13)

Case studies directed towards defining major physical and chemical fluxes and determining chemical mass balances for the Beaufort Sea in general. (P.I.S. 11)

Information
Services:

Maintenance of a working library for environmental reviews/reports of use for marine assessment by government/industry/public. This includes cataloguing and indexing all existing marine environmental reviews and data reports for the western arctic and B.C. west coast in a working library at IOS; initiation of interfacing with other DFO, government and industry holdings including WATDOC (BEIRS), AWAC, APOA; and Institution of a proprietary/confidential holdings capability where required or appropriate.

Agency: CANADIAN HYDROGRAPHIC SERVICE, ATLANTIC REGION
P.O. Box 1006
Dartmouth, Nova Scotia B2Y 4A2

Contact: Adam J. Kerr Telephone: 902-426-3497
Regional Director, Hydrography

Objectives: The Canadian Hydrographic Service, Atlantic Region, provides navigational charts, publications and other hydrographic information from the Canadian Atlantic region and eastern Canadian Arctic for the use of the marine community. It also develops and tests, special navigational systems, and data processing, storage and display systems.

Areas of Expertise: Surveys and production of Navigational Charts, Ocean mapping, Navigation systems, Tides, Currents and Water Levels.

Current Projects:

- a) Field Surveys for the Production of Navigation Charts and related Publications:
 - survey of Belle Isle Strait (Chart 4027)
 - surveys on the Labrador Coast between Hamilton Inlet and Nain
 - survey of critical areas in Prince of Wales Strait
 - survey of eastern approaches to Lancaster Sound
- b) Production of Navigational Charts
 - complete a preliminary chart of Bridport Inlet
- c) Tides, Currents and Water Levels
 - development of submersible, telemetering tide gauge for Arctic use
- d) Ocean Mapping
 - obtain resource maps of the continental margin of eastern Canada and Canadian Arctic (northern Baffin Bay, Northern Labrador Sea and Davis Strait)
- e) Navigation
 - conduct an evaluation of Mini-Loran-C, Skywave Loran C and VHF positioning systems in the Arctic
 - conduct a study on Loran-C in the Beaufort Sea.

Agency: DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT
Northern Affairs Program
P.O. Box 2100
Inuvik, N.W.T. XOE OTO

Contact: David W. Milani Telephone: 403-979-3361

- Objectives:
- a) Beaufort Sea Referral
 - Act as a Pollution Prevention Officer under the Arctic Waters Pollution Prevention Act.
 - Appraise all applications, reports and contingency plans submitted by industry for offshore oil and gas exploration.
 - Prepare consolidated reports for submission to the Arctic Waters Advisory Committee (AWAC).
 - Assisting the Departmental and other agencies in conducting clean-up operations of major spills (e.g., major oil spills).
 - b) North of 60° Referral
 - Act as an Inspector under the Northern Inland Waters Act.
 - Review, evaluate and make recommendations on existing and proposed water related developments in the Inuvik District.
 - Determine and develop terms and conditions to be included in Licences and Authorizations, to ensure that the water use and waste handling facilities of a development are adequate in design and operation.
 - Conduct and report on field surveys for the collection of biological, hydrometeorological, topographic, surface and groundwater, geotechnical and water quality data in order to interpret water phenomena.

- Area of Expertise:
- Knowledge of basic hydrology, biology and limnology.
 - Experience in methods, techniques and equipment used in the collection of biological, hydrological and meteorological data.
 - The ability to conduct detailed on-site investigations of water related developments at mining sites, petroleum exploration sites and support facilities, construction camps and stream crossings.
 - Knowledge of waste water treatment and disposal.

- Current Projects:
- a) As a Pollution Prevention Officer
 - Carry out scheduled inspections of petroleum exploration sites, shore based facilities and ship mooring basins and prepare detailed Environmental Inspection Reports based on these investigations. These

reports provide an ongoing, regular means for interested parties to keep informed about existing conditions and provide knowledge of industry's compliance with established operating conditions.

- Prepare an annual Inspectors Report consolidating the on-site investigations detailing industry's compliance with operating conditions, reporting on significant events, up-dating past events and make future recommendations based on the data collected.

- Follow up and report on as many toxic material spills as time permits to determine cause and make recommendations for future reference.

b) As an Inspector

- Carry out inspections of petroleum support facilities (i.e., camps, refineries) and prepare detailed Environmental Inspection Reports to determine compliance with conditions detailed in Licences or Authorizations issued under the Northern Inland Waters Act.

- Follow up and report on toxic material spills that may affect inland waters.

- Carry out inspections of municipal water and waste water treatment facilities to determine if the facility is adequate in design and operation considering the possibilities of increased activity.

See Project Information Sheet 79.

Information
Services:

Data base files can be accessed upon request.

Publications:

All Environmental Inspection Reports become public upon release.

Agency: DEPT. OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT (DIAND)

Centre: NORTHERN RESEARCH INFORMATION AND DOCUMENTATION SERVICE
Northern Social Research Division
9th Floor, Les Terrasses de la Chaudière.

Enquiries: Telephone: 819-997-9666

Objectives: To encourage and support social research in the North, by obtaining information on current and recent research from researchers in the federal and territorial governments, universities, native organizations, consultants and industry and disseminating this research information to those who need it; to maintain a close relationship with administrators, program and policy planners of this department so that they can make use of research findings; to act as a source of information on northern research to the National Research Council's Canada Institute for Scientific and Technical Information System, (CAN/OLE).

Subject Coverage: Current and recent studies and research on northern social concerns. "Social" is interpreted in its broadest sense, to include anything which may affect life in the Canadian North. "Northern" includes the northern parts of the provinces.

Holdings: Detailed information on research going on at the time the request is made, on special cards filed according to subject, geographic area and source of the research. Starts in early '70's and continues right up to date.

Unpublished reports of such research as it is completed, plus other unpublished relevant reports.

Users: Anyone who requires this information, within and outside the government.

Services & Facilities: Gathering information relating to current research being done on the Canadian North and periodically updating it; collecting unpublished research reports; responding to requests by mail, telephone or personal visit; referral to appropriate sources when the centre does not retain the required information; disseminating research information to researchers through the compilation and distribution of published lists of holdings and through CAN/OLE.

Publications: Current and Recent Research Studies Related to Northern Social Concerns, v. I 1975/76, v. II 1977-78, v. III Parts 1 and 2 1978-79, v. IV Part 1 1980-81.

- Systems: The centre's holdings are available on-line through the Canada Institute for Scientific and Technical Information, on CAN/OLE.
- Reference: Directory of Departmental Information Centres, 1980. Departmental Library, Administrative Services Directorate, Dept. of Indian Affairs and Northern Development, p. 11.

Agency: NORTHERN ENVIRONMENTAL PROTECTION BRANCH
Northern Environment Directorate
Department of Indian and Northern Affairs
Ottawa, Ontario
K1A 0H4

Street Address:

Les Terrasses de la Chaudière
10 Wellington Street
Hull, Quebec

Contact: E.K. Langtry Telephone: 819-997-9090
Acting Director
Northern Environmental Protection Branch.

Objectives: Conduct environmental screening for all projects on Federal lands north of 60° latitude.

Specifically responsible for initial screening of the Environmental Impact Statement on the Beaufort Sea Hydrocarbon production as the initiating department in the FEARO review.

Areas of Expertise: The staff of the Branch is capable of assessing the environmental aspects of projects in the following disciplines:
Marine Mammalogy
Terrestrial Wildlife
Fisheries Resources
Geology
Hydrology
Engineering and Physical Oceanography
Vegetation

Current Projects: Uptake and Retention of Petroleum Hydrocarbons in Tissue of Benthos. (P.I.S. 141)

Information Services: Departmental Library

Publications: Arctic Land Use Research Series
Mackenzie Highway Environmental Studies
Mackenzie Highway Design Reports
- Geologic information as borehole logs
- Hydrologic information.

Agency: OFFICE OF NATIVE CLAIMS, NWT AND LABRADOR GROUP
Dept. Indian and Northern Affairs
Ottawa, Ontario K1A 0H4

Contact: K.J. Crowe Telephone: 819-994-1174
Senior Negotiator
NWT and Labrador Group
Office of Native Claims

Objectives: Negotiator of Dene/Métis and I.T.C. claims

Areas of Expertise: Knowledge of claims - related matters and native concerns
in regions adjacent to the Beaufort Sea and on proposed
shipping lanes.

Current Projects: I.T.C. and Dene/Métis claims negotiations. (P.I.S. 142)

Information Services: Information Officer, Bernard Assiniwi (819) 994-4122

Publications: Occasional information bulletins and annual departmental
report.

Agency: DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT
(DIAND)
INDIAN AND INUIT AFFAIRS PROGRAM

Centre: PROGRAM SERVICES
Program Reference centre
17th Floor, Les Terrasses de la Chaudière

Enquiries: P. Tighe Telephone: 819-997-9117
S. St. Amour

Objectives: To act as the Program repository for the collection and dissemination of statistical, genealogical and related historical information and documents pertaining to the culture, social and economic life of Indian and Inuit people.

Subject Coverage: Statistics, genealogy, history of the Canadian Indian and Inuit

Holdings: Statistical information, in-house reports, unpublished research documents and papers, policy statements, procedures and guidelines, genealogical and related historical information, Orders in Council and Treasury Board Minutes, Program Delegations of Authority relating to the Indian and Inuit Affairs Program.

Users: Anyone requesting information from the Centre.

Services & Facilities: Provision of an area for the users to examine the Program Centre's files and documents; centre staff are available as resource people when required; Centre provides interpretation of information; provision of genealogical and related historical research.

Publications: Catalogue of Statistical Data, March 1980 (free); Bibliography of Economic Development Consultant Reports (free); Acquisition List of New Material (free); Maps of Indian Bands of Canada (internal use only).

Equipment: Photocopier; microfiche reader/printer.

Systems: Cataloguing: Centre has its own indexing system, classification and coding and manual storage and retrieval system.

Reference: Directory of Departmental Information Centres, 1980. Departmental Library Administrative Services Directorate, Dept. of Indian Affairs and Northern Development, p. 10.

Agency: DEPARTMENT INDIAN AFFAIRS AND NORTHERN DEVELOPMENT
LIBRARY SERVICES
Finance and Professional Services Program
Information Resources Division
14th Floor, Les Terrasses de la Chaudière

Enquiries: J. McNiven (Reference) Telephone: 819-997-0799
H. Lanthier (Loans)
M. Nolet (Publication Distribution) 819-997-0380

Objectives: To organize, direct, control, administer and coordinate library services to meet departmental, program and directorate requirements. To be an information repository responsive to all users (administrative, scientific, research, technical), packaging and providing services and information in the form most useful to these groups.

Subject Coverage: Indians of North America, Inuit, the Canadian North, Canadian and American history, archaeology, anthropology, engineering, architecture, fine arts, economic development, sociology, natural sciences, parks and recreation.

Holdings: 75,000 monographs; 16,000 bound volumes of periodicals; 2,000 government documents; 2,000 periodical subscriptions; 1,400 reprints; 3,000 vertical file items; audio cassettes; press clippings from 1968 to date.

Users: Departmental personnel, employees of other government departments and agencies, experienced researchers. Graduate students must apply in advance to the Head Librarian.

Services & Facilities: User assistance, internal loans, interlibrary loans, reference and information services, current awareness (limited), acquisition of all books and periodicals purchased by the department, periodical routing (restricted to purchasing division); reading areas and study carrels for 35 users at any given time; Canadian Press Wire Service.

Publications: "Departmental Library Acquisition List", February 1969 - (monthly) (Selected distribution).

Equipment: Xerox 4000 photocopier; Recordak motormatic microfilm reader; Bell & Howell reader/printer; Vucom 4 terminal and printer.

Systems: Periodical ordering control system, IBM System 360-50-1.

Reference: Directory of Departmental Information Centres. 1980.
Departmental Library, Administrative Services Directorate, Dept. Indian Affairs and Northern Development, p. 1.

Agency: DEPT. INDIAN AFFAIRS AND NORTHERN DEVELOPMENT
NORTHERN AFFAIRS PROGRAM
NORTHERN PIPELINES BRANCH (NOW MAJOR PROJECTS ASSESSMENT
BRANCH)
8th Floor, Les Terrasses de la Chaudière

Enquiries: B. McGregor Telephone: 819-997-0990

Objectives: To provide a centralized information bank pertaining to
northern hydrocarbon transportation containing
environmental, social, economic, technical, political and
legal material.

Subject
Coverage: Current and historical materials dealing with northern
pipeline proposals and construction with emphasis on the
Yukon and Northwest Territories.

Holdings: Reports, studies, applications, supporting material,
exhibits and transcripts to the Mackenzie Valley Pipeline
Inquiry and Alaska Highway Pipeline Inquiry; pipeline
proposal applications and supporting documentation; related
government decisions, policies, legislation and periodicals;
air photos of the Mackenzie Valley.

Users: Individuals conducting research pertaining to northern
hydrocarbon transportation and its impact on the North.

Services &
Facilities: Suitable work area is provided with the Documentation
Centre to permit researchers to peruse materials (including
large maps). Access to photocopier is available. Materials
are not loaned out, research must be carried out in the
Documentation Centre.

Systems: Cataloguing: own indexing system; storage and retrieval;
manual system.

Reference: Directory of Departmental Information Centres. 1980.
Departmental Library, Administrative Services Directorate,
Dept. of Indian Affairs and Northern Development, p. 14.

Agency: Dept. Indian Affairs and Northern Development (DIAND)
NORTHERN AFFAIRS PROGRAM
Northern Economic Planning Branch
Data Management Division
NORTHERN STATISTICAL INFORMATION CENTRE
6th Floor, Les Terrasses de la Chaudière

Enquiries: D.E. Stewart Telephone: 819-997-0550

Objectives: to provide: (i) accurate, comprehensive, historically consistent and current information and statistical data on the Northwest Territories and the Yukon Territory; (ii) a system for the quick and efficient storage and retrieval of this information and statistical data.

Subject Coverage: A broad spectrum of socio-economic and demographic information pertaining to the Yukon and Northwest Territories.

Holdings: Reports (confidential and general); conference documents; individual papers; maps; charts, acts; annual reports; periodicals; publications of the Northern Economic Planning Branch and others; statistical information series on socio-economic and demographic subject matter areas.

Users: Anyone conducting or requiring research pertaining to social, economic and demographic aspects of residents in the Yukon and Northwest Territories.

Services & Facilities: Provision of a reference area for researchers to examine reports, documents and statistical information; collection, compilation, dissemination and analyses of socio-economic and demographic information pertaining to the Yukon and Northwest Territories; the gathering of quantitative information via surveys, other primary and secondary sources, administrative sources in which interest has been shown by users; preparation of analytical reports; consulting advice in economics, statistics and computer systems.

Equipment: Photocopier; calculators (standard and programmable); use of computer systems.

Systems: Cataloguing: own indexing system for (i) reports storage and retrieval; (ii) socio-economic and demographic data base. Storage and retrieval: some systems manual and some computerized.

Reference: Directory of Departmental Information Centres. 1980. Departmental Library, Administrative Services Directorate, Dept. Indian Affairs and Northern Development, p. 12.

Agency: DIVISION OF BUILDING RESEARCH
National Research Council
Ottawa, Ontario K1A 0R6

Contact: L.W. Gold Telephone: 613-993-2480

Areas of Expertise: Research on the strength and deformation properties of permafrost and ice.

Projects: - No specific projects in the Beaufort Sea region.

Information Services: - Provision of technical advice to government departments.

Agency: NORTHERN CANADA POWER COMMISSION
7909 - 51 Avenue
P.O. Box 5700, Stn. "L"
Edmonton, Alberta
T6C 4J8

Contact: B.G. Christie Telephone: 403-465-3377
Telex - 037-2736

Objectives: Electrical public utility supply in the Inuvik-Tuktoyaktuk,
NWT area. (P.I.S. 52)

Areas of Expertise: Electrical utility expertise.

Current Projects: Assessment of alternatives for an expanded power supply for
the Inuvik - Tuktoyaktuk area, including a possible expanded
diesel plant at Tuktoyaktuk, upgrading of an existing 69 kV
transmission line between Inuvik and Tuktoyaktuk, and a
possible gas-turbine operation at Parsons Lake to utilize
gas reserves in that area.

Information Services: NCPC library and Central Records.

Agency: PUBLIC WORKS CANADA - WESTERN REGION
9925 - 109 Street
P.O. Box 488
Edmonton, Alberta
T5J 2K1

PUBLIC WORKS CANADA - PACIFIC REGION
1110 W. Georgia Street
Vancouver, B.C.
V6E 3W5

Contact: For both Western and Pacific Region interests:
C.D. Forbes Telephone: 403-420-3235
Manager, Marine Division
Public Works Canada
Edmonton, Alberta

Objectives: Western Region - objectives & responsibilities:
(a) Accommodation (housing) for Federal Civil Servants in the N.W.T. using P.W.C. funds.
(b) Office accommodation for Other Government Departments in the N.W.T. using P.W.C. funds.
(c) Realty Services, Design & Construction Services for Other Government Departments in the N.W.T. viz R.C.M.P., National Health & Welfare, Indian & Northern Affairs, and others on an as requested basis.
(d) Design and construction of new highways in the N.W.T. on behalf of Indian & Northern Affairs.
(e) River improvement works, dredging, wharves, harbours, breakwaters, shore protection works using P.W.C. funds and/or Other Government Department funds.

Pacific Region - same objectives and responsibilities in the Yukon as outlined above for the Western Region.

Public Works Canada's interest in the Beaufort Sea Hydrocarbon production proposal is in the impact the large-scale exploratory drilling program, production, and transportation of oil and gas, will have on the Department's own programs and other government department programs for which we act as a service agency.

Areas of Expertise:

- Planning and management accommodation services.
- Realty services viz legal surveys, property and land management and assessments.
- The planning, design and construction of offices, apartments, nursing stations, hospitals, etc.
- The planning, design and construction of highways and bridges.
- Harbours, rivers, and coastal engineering including dredging.

Current
Projects;

Projects/Investigations/Studies:

- Dempster Highway planning, design and construction.
- Planning and investigation studies for the proposed Inuvik to Tuktoyaktuk Highway.
- Mackenzie Highway planning, design and partial construction.
- Liard Highway planning, design and construction.
- Permafrost studies for highway and building construction.
- Holman Island Nursing Station.
- Cape Dorset Nursing Station.
- Frobisher Bay housing.
- Studies for building standards in the north.
- Report for a proposed marine terminal at Frobisher Bay including examination of problems in curing concrete in the Arctic sea water.
- Planning and supervision of construction of the concentrate loading wharf at Nanasivik.
- Investigation, study and report on shore erosion and protection of permafrost areas at Tuktoyaktuk.
- Mackenzie River investigation report for Navigation Channel Improvements by way of dredging.
- Environmental Impact Investigation and Report for proposed Mackenzie River major dredging program.

INFORMATION SURVEY - KIND AND SOURCES - FOR THE
ENVIRONMENTAL ASSESSMENT REVIEW PROCESS -
BEAUFORT SEA HYDROCARBON PRODUCTION AND TRANSPORTATION PROPOSAL

SECTION II: PROJECT INFORMATION

- II.1 List of Project Information Sheets
- II.2 Subject-by-zone Index
 - II.2.1 Category Descriptions
 - II.2.2 Index to Project Information Sheets
- II.3 Project Information Sheets

II.1 List of Project Information Sheets

Project Information Sheet No.	Title
1	Oil Spill Prevention/Cleanup/Impact Production: Current Projects 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.
2	Ice Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.
3	Remote Sensing Program 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.
4	Geotechnical Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.
5	Oceanographic Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.
6	Research Program for Canmar Kigoriak, An Experimental Class 4 Icebreaker (1979-1980). Beaufort Sea Production Development. Dome Petroleum Ltd.
7	Biological - Chemical Research 1980, Beaufort Sea Production Development. Dome Petroleum Ltd.
8	Beaufort Sea Production Environmental Studies 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd.
9	Oceanographic and Sea Ice Research 1979- 1980. Beaufort Sea Production Development. Dome Petroleum Ltd.
10	Oil Spill Research 1979-1980. Oil Spill Prevention/Cleanup/Impact Prediction: Recent Studies 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd.
11	Case studies directed towards defining major physical and chemical fluxes and determining chemical mass balances for the Beaufort Sea in general.

Cont. (Project Listing)

Project Information Sheet No.	Title
13	Review and assessment of existing data for the marine science disciplines in the Beaufort Sea Hydrocarbon Production Area.
14	Beaufort Sea Studies: Ocean Information Division.
15	Northlands Ecoregions
16	Ecodistrict mapping for the Northwest Territories.
17	Ecological baseline information system for the Beaufort Sea Planning Area.
18	Surficial geology and geomorphology. Mackenzie Bay - Continental Shelf.
19	Ice services in support of marine activity.
20	Coastal Reconnaissance of the Sverdrup Basin, N.W.T.
21	Coastal Reconnaissance of Bylot and N.E. Baffin Islands, N.W.T.
22	Coastal erosion - sedimentation, Northern Somerset Island, N.W.T.
23	Establishment of environmental design parameters for Beaufort Sea development - Geotechnical information requirements.
24	Workshop on the impact of the Dempster Corridor on the Mackenzie Delta
25	Physical Oceanographic Program - Atlantic Oceanographic Laboratory
26	Marine pollution chemistry
27	APOA projects - General

Cont. (Project Listing)

Project Information Sheet No.	Title
28	Arctic Marine Oilspill Program
29	EAMES - Eastern Arctic Marine Environmental Studies
30	Offshore wind/wave climate studies
31	Climatic study of northwestern Baffin Bay.
32	Regional climate study of the Canadian Arctic Islands and adjacent waters.
33	Arctic air temperatures relevant to steel selection for ship hulls
34	Climatic change in the Arctic
35	Environmental aspects of Arctic marine transportation: Sea state, ice and weather.
36	Annual reports of Beaufort Weather Office (BWO).
37	Operational Systems design R & D
38	None
39	Satellite ice status system R & D
40	Marine oil spill trajectories R & D
41	Wave and swell forecasting R & D
42	Sea-ice modelling R & D
43	Long term fate and effects of Balaena Bay oil spill
44	Study of ice conditions along a year round shipping route from the Bering Strait to the Canadian Beaufort Sea, June 1979.
45	Air deployable oil spill ignitor tests, Yellowknife, May 1979.

Cont. (Project Listing)

Project Information Sheet No.	Title
46	Oil and gas under sea ice, Dec. 1980
47	Ice conditions along Arctic tanker routes (to be included in volume 3 of Dome's Beaufort Sea Production, E.I.S.)
48	Sea ice motion in the southeastern Beaufort Sea, 1978.
49	Beaufort Sea winter ice experiment 1979: Oceanography
50	Beaufort Sea winter ice experiment 1981: Oceanography.
51	Arctic Marine Oilspill Program (AMOP).
52	Expanded power supply alternatives for Inuvik - Tuktoyaktuk area.
53	Physical oceanography in the Northwest Passage.
54	Fish, invertebrates and marine plants of the Southern Beaufort Sea - An overview.
55	Microbiology of water and sediments at Issunguak Artificial Island
56	Wave climate study.
57	Terrain, land use and waste drilling fluid disposal problems adjacent to exploratory wellsites in permafrost, Arctic Canada.
58	The study of coastal processes and dynamics, Southwest Banks Island, Western Canadian Arctic.
59	Responses of Peary caribou and muskoxen to helicopter harassment.
60	Inter-island movement of Peary caribou
61	Lakes regime, Mackenzie Delta, N.W.T.

Cont. (Project Listing)

Project Information Sheet No.	Title
62	Ice regime of lower Mackenzie River and Mackenzie Delta.
63	Northern highways hydrology study, Mackenzie Delta region, N.W.T.
64	Studies of behaviour and effects of oil spills in Arctic lands and waters and spill countermeasures, especially chemical dispersion.
65	Sub-seabottom permafrost mapping - Beaufort Sea
66	Hudson Strait seabird study - year 2 of 3
67	Seabird population studies in Lancaster Sound and vicinity.
68	Frontier subsea pilot production project (Beaufort)
69	Extended well production test riser system for Dome Petroleum
70	The feasibility of underwater containment of subsea oil spills in Arctic waters (Oil spill containment study - 1979)
71	Subsea containment study task 3 (C-CORE: 426-0)
72	Design study of oil skimmer for use in Canadian waters
73	Arctic Pilot Project (A.P.P.)
74	4th Service System design (Arctic service system - In-house R & D)
75	National Energy Program - Energy R & D Oil and Gas Task 3.26 - Offshore temperature studies.
76	National Energy Program - Energy R & D: Oil and Gas Task 7.6. Study of shallow thermal aspects for pipelining.

Cont. (Project Listing)

Project Information Sheet No.	Title
77	National Energy Program - Energy R & D: Oil and Gas Task 3.1. Fundamental studies of moisture migration.
78	National Energy Program. Energy R & D: Oil and Gas Task 2.2. Geological and Geophysical studies of gas hydrates.
79	Water resources officer - Northern Affairs Program, Northern Operations Branch, District Operations, Inuvik, NWT
80	Northern Technology Unit Projects
81	Coastal characteristics of the Northwest Passage.
82	Regional Analysis study of the western Arctic Archipelago Marine Region #4
83	Parks analysis Natural Region #26
84	Shoreline analysis, Alaska & Arctic Canada
85	Coastal geology mapping, central Sverdrup Basin, N.W.T.
86	Beaufort Sea coastal video survey
87	Northwest Passage video-tape survey
88	BIOS Oil Spill
89	APOA Beaufort Oil Spill Workshop
90	AMOP spill site selection
91	EAMES Atlas Workshop
92	Southeast Newfoundland oil spill countermeasures study.
93	Tuktoyaktuk Harbour Master Plan
94	Transportation of gas and oil from the Arctic Islands

Cont. (Project Listing)

Project Information Sheet No.	Title
95	Laboratory study of heat transfer at ice/water interface.
96	Tanker terminals feasibility for a petrochemical complex.
97	Feasibility study, deepwater transshipment storage facility.
98	Risk analysis for pipeline construction
99	Oil and gas production facilities for offshore Labrador
100	Ice management for Arctic LNG terminal.
101	Compilation of ice forces against structures
102	Ice studies for exploratory drilling system
103	Crossing of ship tracks in Barrow Strait
104	Stress analysis of Barrow Strait ice cover
105	Production and gathering system; Design and project management
106	Economic development plan.
107	Oil and gas exploration supply base
108	Geotechnical investigations of proposed Mackenzie highway.
109	Yukon grizzly bear studies
110	Study of the tourism potential for the Mackenzie Valley communities.
111	Market opportunities - North of 60°
112	Transportation feasibility studies
113	Financial analysis of Arctic pipeline applications.

Cont. (Project Listing)

Project Information Sheet No.	Title
114	Radarsat Project
115	Oceanographic monitoring in Barrow Strait
116	Ice studies in the Central Arctic
117	G-UMPS (Gyroscope unmanned profiling system).
118	Oceanography of Hudson/James Bays
119	Hire North evaluation study
120	Socio-economic impact assessment of the Arctic Pilot Project on selected high Arctic communities.
122	Assessment of the socio-economic impacts and damages resulting from the Grand Rapids 1960-1980 (with projections to year 2000)
123	Construction and use of winter roads during pipeline construction, to reduce terrain and vegetation impacts
124	Candidate Natural Areas of Canadian Significance and Natural Sites of Canadian Significance in Natural Region 8 and in Natural Region 7.
125	Regulatory consulting services to private industry.
126	Beaufort coastal survey.
127	Mckinley Bay, Beaufort Sea
128	Ocean Dumping Standardization
129	Monitoring and assessment of the commercial fishery potential in the Mackenzie Delta.

Cont. (Project Listing)

Project Information Sheet No.	Title
130	Mackenzie Delta - Beaufort Sea Project
131	Tuktoyaktuk Lakes Study
132	Subsistence Beluga/Narwhale exploitation - Mackenzie Delta and Baffin area.
133	Energy related organics
134	Metals in Arctic ecosystems
135	Heavy metal and hydrocarbon monitoring in sediments and fishes along the Tuktoyaktuk Peninsula.
136	Coastal migrations: Spawning areas.
137	Water quality monitoring in Tuktoyaktuk Harbour.
138	Data inventory of Bowhead and White whales in the Beaufort Sea and adjacent marine waters
139	Review and assessment of existing data for fish and marine mammals in the Beaufort Sea hydrocarbon production area and along possible transportation corridors
140	Onshore impacts of offshore hydrocarbon development: An annotated bibliography.
141	Uptake and retention of petroleum hydrocarbons in tissues of benthos.
142	Negotiation of the a) I.T.C. and b) DENE/METIS claims.
143	Northern land use information series mapping project.
144	Historical development of current patterns of Inuit culture and implications with respect to future development.
145	Bowhead whale distribution and movement study.

Cont: (Project Listing)

Project Information Sheet No.	Title
146	Arctic Seas study
147	Bowhead whale behaviour
148	Northern Shore zone management (II)
149	Legal aspects of marine transit in the Arctic.
150	Effects of spilled crude oil on micro-organisms.
151	Ecology of the Canadian Arctic Archipelago: Selected references. Volume 9.
152	Biological changes resulting from drilling fluid disposal in the Canadian Arctic.
153	Past oil spill recovery of Arctic vegetation.
154	Terrain - vehicle interaction - Keewatin
155	Temperature effects of crude oil on polar bears.
156	Bowhead whale sightings in the Central and Eastern Canadian Arctic.
157	Haematological and petroleum residue studies of experimental polar bears.
158	BIOS - Baffin Island Oil Spill
159	Histopathology and Haematology of experimental polar bears.
160	Ecological basis for environmental impact assessment in Canada.
161	Applicability of Scottish shore experience to Canadian Beaufort Sea development.
162	Environmental Assessment Panel Projects.

Cont: (Project Listing)

Project Information Sheet No.	Title
163	Ice behaviour C-CORE Program
164	Seabed Group (C-CORE)
165	Radar Group (C-CORE)
166	Hydrocarbon Group (C-CORE)

II.2 INDEX: SUBJECT BY ZONE

II.2.1 Category Descriptions

Zones: (from Draft Guidelines for the Preparation of an Environmental Impact Statement, the Beaufort Sea Hydrocarbon Production Proposal, Beaufort Sea Assessment Panel, June 1981).

Zone I - Beaufort Sea and adjacent coastal areas. This zone should encompass all potential areas of production in the Beaufort Sea and should include the coastal (including the Yukon coast) and Mackenzie Delta areas that may be affected by off-shore and on-shore activities, by shore-based marine terminals, and by shore-based support facilities and activities. This zone should extend from the Alaska/Canada border in the west to Amundsen Gulf in the east.

Zone II - Terrestrial areas north of 60°. This zone should encompass all pipeline and transportation corridors.

Zone III - Tanker routes. This zone should encompass all tanker routes in Canadian waters and adjacent land areas north of 60° and outside of Zones I and II.

Subjects:

The subject categories used were adapted from those suggested in the Draft Guidelines for the Preparation of an Environmental Impact Statement - Beaufort Sea Environmental Assessment Panel, June 1981. Although all categories are not applicable in all zones, the same index system was used throughout.

Indexing of the projects has been arbitrary to some degree based on the information contained in the information sheets. A more thorough knowledge of the project might lead to a different indexing. Suggestions are welcome and will be included in any update of this report.

SUBJECT CATEGORIES

1. General

Multi-component studies relevant to some aspect of the Beaufort Sea proposal.

2. Proposal (Design) Related

Studies pertaining to methodology, systems, design criteria, feasibility, operational requirements, etc.

3. Environmental Setting

Baseline studies to provide descriptions of the physical, biological and socio-economic environment to identify and assess possible effects of the proposal.

3.0 Ecosystem Studies

Studies integrating aspects of the physical-biological and socio-economic environment.

3.1 Physical Environment

3.1.1 Environmental Hazard Prediction (weather sea-state and ice information).

3.1.2 Climate and Air Quality.

3.1.3 Oceanography and Sea Ice.

3.1.4 Geology, Terrain and Coastal Morphology.

3.1.5 Permafrost and Thermal Regime (including hydrate studies).

3.2 Biological Environment

3.2.1 Marine and Freshwater Systems (plants and animals).

3.2.2 Terrestrial Systems (plants & animals).

3.2.3 Birds.

3.3 Socio-Economic Environment.

4. Impact Studies & Analysis.

Impact of the proposal on the environment and impact of the environment on proposal components.

4.1 Physical Environment Effects.

4.2 Biological Environment Effects.

4.3 Socio-Economic Effects.

5. Environmental Hazards.

5.1 Major Spills.

II.2.2 Subject Index (by Zones) to Project Information Sheets

ZONE I. Beaufort Sea Zone and Adjacent Coastal Areas.

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
1. <u>GENERAL</u>		
	APOA projects - General	27
	Regulatory consulting services to private industry.	125
	Negotiation of the a) I.T.C. and b) DENE/METIS claims.	142
	Ecological basis for environmental impact assessment in Canada.	160
	Environmental Assessment Panel Projects.	162
2. <u>PROPOSAL (DESIGN) RELATED</u>		
	Research Program for Canmar Kigoriak, An Experimental Class 4 Icebreaker (1979-1980). Beaufort Sea Production Development. Dome Petroleum Ltd. (Proj. 1. Beaufort Sea Pollution Zones Proj. 6 Environmental Impact Assessment Management and Planning. Proj. 8 An Engineering and environmental study of the use of explosive in ice).	6
	Oceanographic and Sea Ice Research 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd.	9
	Arctic air temperatures relevant to steel selection for ship hulls	33

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone I 2.0 (cont.)		
	Wave climate study.	56
	Frontier subsea pilot production project (Beaufort)	68
	Extended well production test riser system for Dome Petroleum	69
	4th Service System design (Arctic service system - In-house R & D)	74
	Tuktoyaktuk Harbour Master Plan	93
	Laboratory study of heat transfer at ice/water interface.	95
	Oil and gas production facilities for offshore Labrador	99
	Compilation of ice forces against structures	101
	Ice studies for exploratory drilling system	102
	Production and gathering system; Design and project management	105
	Oil and gas exploration supply base	107
	Applicability of Scottish shore experience to Canadian Beaufort Sea development.	161

3. ENVIRONMENTAL SETTING

3.0 Ecosystem Studies

Ecological baseline information system for the Beaufort Sea Planning Area.	17
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<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
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Zone I (cont.)

3.1 Physical Environment

3.1.1 Environmental Hazard Prediction

Ice Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd. (Proj. 7 Remote Sensing and Forecasting, Proj. 8 Kigoriak ice breaking trials, Proj. 10 Ice floe tracking).	2
Remote Sensing Program 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.	3
Ice services in support of marine activity.	19
Environmental aspects of Arctic marine transportation: Sea state, ice and weather.	35
Annual reports of Beaufort Weather Office (BWO).	36
Operational Systems design R & D	37
Satellite ice status system R & D	39
Wave and swell forecasting R & D	41
Sea-ice modelling R & D	42
Radarsat Project	114
Radar Group (C-CORE)	165

3.1.2 Climate and Air Quality

Climatic change in the Arctic	34
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3.1.3 Oceanography and Sea Ice

Ice Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.	2
Oceanographic Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.	5

Subject
Categories

Project
Title

Project Information
Sheet No.

Zone I
3.1.3 (cont.)

Beaufort Sea Production Environmental Studies 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd. (Proj. 5 Oceanographic baseline data collection program).	8
Oceanographic and Sea Ice Research 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd.	9
Case studies directed towards defining major physical and chemical fluxes and determining chemical mass balances for the Beaufort Sea in general.	11
Review and assessment of existing data for the marine science disciplines in the Beaufort Sea Hydrocarbon Production Area.	13
Beaufort Sea Studies: Ocean Information Division.	14
Surface and mixed layer oceanography	25
Wave and swell forecasting R & D	41
Sea-ice modelling R & D	42
Sea ice motion in the southeastern Beaufort Sea, 1978.	48
Beaufort Sea winter ice experiment 1979: Oceanography	49
Beaufort Sea winter ice experiment 1981: Oceanography.	50
Wave climate study.	56
Compilation of ice forces against structures	101
Ice studies for exploratory drilling system	102
G-UMPS (Gyroscope unmanned profiling system).	117

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone I (cont.)		
3.1.4	<u>Geology, Coastal Morphology and Terrain</u>	
	Geotechnical Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.	4
	Biological - Chemical Research 1980, Beaufort Sea Production Development. Dome Petroleum Ltd. (Proj. 7. Coastal survey)	7
	Surficial geology and geomorphology. Mackenzie Bay - Continental Shelf.	18
	Coastal reconnaissance of the Sverdrup Basin, N.W.T.	20
	Establishment of environmental design parameters for Beaufort Sea development - Geotechnical information requirements.	23
	The study of coastal processes and dynamics, Southwest Banks Island, Western Canadian Arctic.	58
	Lakes regime, Mackenzie Delta, N.W.T.	61
	Ice regime of lower Mackenzie River and Mackenzie Delta.	62
	Coastal geology mapping, central Sverdrup Basin, N.W.T.	85
	Beaufort Sea coastal video survey	86
	Northwest Passage video-tape survey	87
	Seabed Group (C-CORE)	164
3.1.5	<u>Permafrost and Thermal Regime (including hydrates)</u>	
	Establishment of environmental design parameters for Beaufort Sea development - Geotechnical information requirements.	23
	Sub-seabottom permafrost mapping - Beaufort Sea	65
	National Energy Program - Energy R & D Oil and Gas Task 3.26 - Offshore temperature studies.	75

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone I		
3.1.5 (cont.)		
	National Energy Program - Energy R & D: Oil and Gas Task 7.6. Study of shallow thermal aspects for pipelining.	76
	National Energy Program - Energy R & D: Oil and Gas Task 3.1. Fundamental studies of moisture migration.	77
	National Energy Program. Energy R & D: Oil and Gas TAsk 2.2. Geological and Geophysical studies of gas hydrates.	78
3.2 <u>Biological Environment</u>		
3.2.1 <u>Marine and Freshwater Systems (plants and animals)</u>		
	Biological - Chemical Research 1980, Beaufort Sea Production Development. Dome Petroleum Ltd. (Proj. 2 Environmental monitoring of dredging activities Proj. 4 Whale surveys - Tuktoyaktuk Peninsula. Proj. 5 Seal surveys, Beaufort Sea (Arctic Islands).	7
	Beaufort Sea Production Environmental Studies 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd. (Proj.3 Environmental baseline data - Kopanoar specific, Beaufort Sea general. Proj. 7 Ecology of the southern Beaufort Sea and Mackenzie Delta: An annotated bibliography. Proj. 8 An engineering and environmental study of the use of explosives in ice).	8
	Fish, invertebrates and marine plants of the Southern Beaufort Sea - An overview.	54
	Microbiology of water and sediments at Issunguak Artificial Island	55
	Beaufort coastal survey.	126
	Mckinley Bay, Beaufort Sea	127
	Monitoring and assessment of the commercial fishery potential in the Mackenzie Delta.	129

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone I		
3.2.1 (cont.)		
	Mackenzie Delta - Beaufort Sea Project	130
	Tuktoyaktuk Lakes Study	131
	Subsistence Beluga/Narwhale exploitation - Mackenzie Delta and Baffin area.	132
	Coastal migrations: Spawning areas.	136
	Data inventory of Bowhead and White whales in the Beaufort Sea and adjacent marine waters	138
	Review and assessment of existing data for fish and marine mammals in the Beaufort Sea hydrocarbon production area and along possible transportation corridors	139
	Bowhead whale distribution and movement study.	145
	Bowhead whale behaviour	147
3.2.3 <u>Birds</u>		
	Biological - Chemical Research 1980, Beaufort Sea Production Development. Dome Petroleum Ltd. (Proj. 6 Bird surveys - Beaufort Sea to Viscount Melville Sound)	7
3.3 <u>Socio-Economic Environment</u>		
	Water resources officer - Northern Affairs Program, Northern Operations Branch, District Operations, Inuvik, NWT	79
	Northern Technology Unit Projects	80
	Economic development plan.	106
	Monitoring and assessment of the commercial fishery potential in the Mackenzie Delta.	129
	Historical development of current patterns of Inuit culture and implications with respect to future development.	144

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone I (cont.)		
4. <u>IMPACT STUDIES AND ANALYSIS</u>		
4.1 <u>Physical Environment Effects</u>		
	Terrain, land use and waste drilling fluid disposal problems adjacent to exploratory wellsites in permafrost, Arctic Canada.	57
	Onshore impacts of offshore hydrocarbon development: An annotated bibliography.	140
4.2 <u>Biological Environment Effects</u>		
	Biological - Chemical Research 1980, Beaufort Sea Production Development. Dome Petroleum Ltd.	7
	Beaufort Sea Production Environmental Studies 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd.	8
	Case studies directed towards defining major physical and chemical fluxes and determining chemical mass balances for the Beaufort Sea in general.	11
	Microbiology of water and sediments at Issunguak Artificial Island	55
	Responses of Peary caribou and muskoxen to helicopter harassment.	59
	Ocean Dumping Standardization	128
	Energy related organics	133
	Metals in Arctic ecosystems	134
	Heavy metal and hydrocarbon monitoring in sediments and fishes along the Tuktoyaktuk Peninsula.	135
	Water quality monitoring in Tuktoyaktuk Harbour.	137
	Onshore impacts of offshore hydrocarbon development: An annotated bibliography.	140

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone I		
4.2 (cont.)		
	Uptake and retention of petroleum hydrocarbons in tissues of benthos.	141
	Effects of spilled crude oil on micro-organisms.	150
	Biological changes resulting from drilling fluid disposal in the Canadian Arctic.	152
	Past oil spill recovery of Arctic vegetation.	153
	Temperature effects of crude oil on polar bears.	155
	Haematological and petroleum residue studies of experimental polar bears.	157
	Histopathology and Haematology of experimental polar bears.	159
4.3	<u>Socio-Economic Effects</u>	
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	Expanded power supply alternatives for Inuvik - Tuktoyaktuk area.	52
	Tuktoyaktuk Harbour Master Plan	93
	Oil and gas exploration supply base	107
	Onshore impacts of offshore hydrocarbon development: An annotated bibliography.	140
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	Applicability of Scottish shore experience to Canadian Beaufort Sea development.	161
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5.1	<u>Major Spills</u>	
	Oil Spill Prevention/Cleanup/Impact Production: Current Projects 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.	1

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone I 5.1 (cont.)		
	Oil Spill Research 1979-1980. Oil Spill Prevention/Cleanup/Impact Prediction: Recent Studies 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd.	10
	Case studies directed towards defining major physical and chemical fluxes and determining chemical mass balances for the Beaufort Sea in general.	11
	Arctic Marine Oilspill Program	28
	Marine oil spill trajectories R & D	40
	Long term fate and effects of Balaena Bay oil spill	43
	Air deployable oil spill ignitor tests, Yellowknife, May 1979.	45
	Arctic Marine Oilspill Program (AMOP).	51
	Studies of behaviour and effects of oil spills in Arctic lands and waters and spill countermeasures, especially chemical dispersion.	64
	The feasibility of underwater containment of subsea oil spills in Arctic waters (Oil spill containment study - 1979)	70
	Subsea containment study task 3 (C-CORE: 426-0)	71
	Design study of oil skimmer for use in Canadian waters	72
	BIOS Oil Spill	88
	APOA Beaufort Oil Spill Workshop	89
	AMOP spill site selection	90
	Southeast Newfoundland oil spill countermeasures study.	92
	BIOS - Baffin Island Oil Spill	158
	Hydrocarbon Group (C-CORE) II.2-13	166

II.2.2 Subject Index (by Zones)

ZONE II: Terrestrial areas North of 60°

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	Risk analysis for pipeline construction	98
	Financial analysis of Arctic pipeline applications.	113
	Construction and use of winter roads during pipeline construction, to reduce terrain and vegetation impacts	123
3. <u>ENVIRONMENTAL SETTING</u>		
3.0 <u>Ecosystem Studies</u>		
	Northlands Ecoregions	15
	Ecodistrict mapping for the Northwest Territories.	16
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	Northern land use information series mapping project.	143
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<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone II (cont.)		
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	Study of the tourism potential for the Mackenzie Valley communities.	110
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	Transportation feasibility studies	112
	Hire North evaluation Study	119
	Historical development of current patterns of Inuit culture and implications with respect to future development.	144
4.	<u>IMPACT STUDIES</u>	
4.1	<u>Physical Environment Effects</u>	
	Terrain, land use and waste drilling fluid disposal problems adjacent to exploratory wellsites in permafrost, Arctic Canada.	57
	Terrain - vehicle interaction - Keewatin	154
4.3	<u>Socio-Economic Effects</u>	
	Long term fate and effects of Balaena Bay oil spill	43
	Study of the tourism potential for the Mackenzie Valley communities.	110
	Assessment of the socio-economic impacts and damages resulting from the Grand Rapids 1960-1980 (with projections to year 2000)	122

II.2.2 Subject Index (by Zones)

ZONE III: Tanker Routes

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
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	EAMES Atlas Workshop	91
	Arctic Seas study	146
	Legal aspects of marine transit in the Arctic.	149
	Environmental Assessment Panel Projects.	162
2. <u>PROPOSAL (DESIGN) RELATED</u>		
	Research Program for Canmar Kigoriak, An Experimental Class 4 Icebreaker (1979-1980). Beaufort Sea Production Development. Dome Petroleum Ltd.	6
	Arctic air temperatures relevant to steel selection for ship hulls	33
	Transportation of gas and oil from the Arctic Islands	94
	Laboratory study of heat transfer at ice/water interface.	95
	Tanker terminals feasibility for a petrochemical complex.	96
	Feasibility study, deepwater transshipment storage facility.	97

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone III 2.0 (cont.)		
	Ice management for Arctic LNG terminal.	100
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3.0 <u>Ecosystem Studies</u>		
	Regional Analysis study of the western Arctic Archipelago Marine Region #4	82
	Parks analysis Natural Region #26	83
	Shoreline analysis, Alaska & Arctic Canada	84
	Ecology of the Canadian Arctic Archipelago: Selected references. Volume 9.	151
3.1 <u>Physical Environment</u>		
3.1.1 <u>Environmental Hazard Prediction</u>		
	Ice Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd. (Proj. 7 Remote SEnsing and forecasting. Proj. 8 Kigoriak ice breaking trials. Proj. 10 Ice floe tracking).	2
	Remote Sensing Program 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.	3
	Ice services in support of marine activity.	19
	Environmental aspects of Arctic marine transportation: Sea state, ice and weather.	35
	Annual reports of Beaufort Weather Office (BWO).	36
	Operational Systems design R & D	37

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone III		
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	Radar Group (C-CORE)	165
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	Climatic study of northwestern Baffin Bay.	31
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	Climatic change in the Arctic	34
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	Oceanographic Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.	5
	Beaufort Sea Production Environmental Studies 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd. (Proj. 5 Oceanographic baseline data collection program).	8
	Oceanographic and Sea Ice Research 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd.	9
	Case studies directed towards defining major physical and chemical fluxes and determining chemical mass balances for the Beaufort Sea in general.	11
	Review and assessment of existing data for the marine science disciplines in the Beaufort Sea Hydrocarbon Production Area.	13

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone III 3.1.3 (cont.)		
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	Surface and mixed layer oceanography	25
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	Sea-ice modelling R & D	42
	Sea ice motion in the southeastern Beaufort Sea, 1978.	48
	Beaufort Sea winter ice experiment 1979: Oceanography	49
	Beaufort Sea winter ice experiment 1981: Oceanography.	50
	Wave climate study.	56
	Compilation of ice forces against structures	101
	Ice studies for exploratory drilling system	102
	G-UMPS (Gyroscope unmanned profiling system).	117
	Surface and mixed layer oceanography	25
	Marine pollution chemistry	26
	Study of ice conditions along a year round shipping route from the Bering Strait to the Canadian Beaufort Sea, June 1979.	44
	Ice conditions along Arctic tanker routes (to be included in volume 3 of Dome's Beaufort Sea Production, E.I.S.)	47
	Physical oceanography in the Northwest Passage.	53
	Ice management for Arctic LNG terminal.	100
	Stress analysis of Barrow Strait ice cover	104

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone III		
3.1.3 (cont.)		
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	Ice studies in the Central Arctic	116
	Oceanography of Hudson/James Bays	118
	Ice-behavior (C-CORE Program)	163
3.1.4	<u>Geology, Terrain and Coastal Morphology</u>	
	Coastal Reconnaissance of Bylot and N.E. Baffin Islands, N.W.T.	21
	Coastal erosion - sedimentation, Northern Somerset Island, N.W.T.	22
	Coastal characteristics of the Northwest Passage.	81
	Shoreline analysis, Alaska & Arctic Canada	84
	Northwest Passage video-tape survey	87
3.2	<u>Biological Environment</u>	
3.2.1	<u>Marine and freshwater Systems</u>	
	Biological - Chemical Research 1980, Beaufort Sea Production Development. Dome Petroleum Ltd.	7
	Review and assessment of existing data for fish and marine mammals in the Beaufort Sea hydrocarbon production area and along possible transportation corridors	139
	Bowhead whale sightings in the Central and Eastern Canadian Arctic.	156
3.2.2	<u>Terrestrial Systems (plants and animals)</u>	
	Inter-island movement of Peary caribou	60
3.2.3	<u>Birds</u>	
	Biological - Chemical Research 1980, Beaufort Sea Production Development. Dome Petroleum Ltd.	7

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone III 3.2.3 (cont.)		
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	Seabird population studies in Lancaster Sound and vicinity.	67
4. <u>IMPACT STUDIES AND ANALYSIS</u>		
4.2 <u>Biological Environment Effects</u>		
	Biological - Chemical Research 1980, Beaufort Sea Production Development. Dome Petroleum Ltd.	7
	Beaufort Sea Production Environmental Studies 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd.	8
	Responses of Peary caribou and muskoxen to helicopter harassment.	59
	Temperature effects of crude oil on polar bears.	155
4.3 <u>Socio-Economic Environment Effects</u>		
	Crossing of ship tracks in Barrow Strait	103
	Socio-economic impact assessment of the Arctic Pilot Project on selected high Arctic communities.	129
5. <u>ENVIRONMENTAL HAZARDS</u>		
5.1 <u>Oilspills</u>		
	Oil Spill Prevention/Cleanup/Impact Production: Current Projects 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.	1
	Oil Spill Research 1979-1980. Oil Spill Prevention/Cleanup/Impact Prediction: Recent Studies 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd.	10

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone III 5.1 (cont.)		
	Case studies directed towards defining major physical and chemical fluxes and determining chemical mass balances for the Beaufort Sea in general.	11
	Arctic Marine Oilspill Program	28
	Marine oil spill trajectories R & D	40
	Long term fate and effects of Balaena Bay oil spill	43
	Air deployable oil spill ignitor tests, Yellowknife, May 1979.	45
	Arctic Marine Oilspill Program (AMOP).	51
	Studies of behaviour and effects of oil spills in Arctic lands and waters and spill countermeasures, especially chemical dispersion.	64
	The feasibility of underwater containment of subsea oil spills in Arctic waters (Oil spill containment study - 1979)	70
	Subsea containment study task 3 (C-CORE: 426-0)	71
	Design study of oil skimmer for use in Canadian waters	72
	BIOS Oil Spill	88
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	AMOP spill site selection	90
	Southeast Newfoundland oil spill countermeasures study.	92
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	Hydrocarbon Group (C-CORE)	166

II.3 Project Information Sheets

Compilation of material received in response to the

Information Survey - Kinds and Sources - for the Environmental
Assessment and Review Process: Beaufort Sea Hydrocarbon Production
and Transportation Proposal.

Program: OIL SPILL PREVENTION/CLEANUP/IMPACT PREDICTION: CURRENT
PROJECTS 1980-81
Beaufort Sea Production Development
Dome Petroleum Limited.

Geographic Area: Beaufort Sea and other Arctic Marine areas.

Objectives: Research on all aspects of oil spill prevention, cleanup and environmental impacts of oil spill - in relation to the ice-covered waters of the Arctic marine environments. The major components of Arctic oil spill prevention, containment and cleanup include:

- oil spill prevention
- oil spill containment
- oil spill cleanup
- oil spill trajectory prediction modelling for Arctic conditions
- delineation of environmentally sensitive areas for priority protection and cleanup
- oil spill risk analysis
- study and analysis of oil spills in and under ice for understanding behavior of oil in an Arctic marine environment
- development of oil spill tracking systems for an Arctic Marine environment.

Projects and Objective: Oil Spill Research related to the Environmental Impact Statement for Hydrocarbon Development in the Beaufort Sea Mackenzie Delta region can be grouped as follows:

A. Documents and contracts for the EIS planned for October, 1981.

<u>Project</u>	<u>Operator</u>	<u>Consultant</u>
Writing of EIS	Dome	S.L. Ross
Scenario Model Work	Dome	Arctic Sciences
Physical Properties of B.S. crude	Esso	In house
Analysis of B.S. crude	Dome	D. Mackay

B. Confidential Documents and data available to support the EIS.

<u>Project</u>	<u>Operator</u>	<u>Consultant</u>
1. Revised Arctic Tanker Risk Analysis	Dome	F.G. Bercha
2. Offshore Prod. Oil	Dome	Gulf USA

Cont:

OIL SPILL PREVENTION/CLEANUP/IMPACT PREDICTION: CURRENT
 PROJECTS 1980-81
 Beaufort Sea Production Development
 Dome Petroleum Limited.

	<u>Project</u>	<u>Operator</u>	<u>Consultant</u>
3.	Arctic Tanker	Dome	F.G. Bercha
4.	Video Tape B.S. Coast	Dome	Woodward Clyde
5.	Bacterial Degrada- tion Study	Dome	Don Westlake
6.	Bird Deterrent Techniques	Dome	LGL
7.	Air Deployable Ignitor Test	Dome	D.F. Dickins
8.	Air Deployable Ignitor Improvements	Dome	Energetex
9.	Oil Spill Tracking Model	Dome	Atmospheric Dynamics
10.	Arctic Tanker Oil Spill Analysis	Dome	DNV
11.	Ignition and Burning Under Spring Time Conditions	Dome	Energetex
12.	Remote Detection of Oil Under Ice	Esso	CRREL
13.	Oil Spill and Iceberg Studies	Esso	In-House
14.	Video Tapes N.W. Passage	Dome	Woodward Clyde
15.	C.O.S.T.	Dome	In-House

C. Projects (In progress or planned for the EIS).

	<u>Project</u>	<u>Operator</u>
1.	Cont. Plan Prod. and Transp.	Dome
2.	Countermeasure Equipment Tankers	Dome
3.	In-Ice Clean-up Systems-Tanker	Dome
4.	Burning in Tankers	Dome
5.	Oil Under Mid Winter Ice	Dome
6.	Fate of Gas Under Ice	Dome

D. Ongoing (or to be carried out) company projects, with potential application to the EIS.

	<u>Project</u>	<u>Operator</u>	<u>Consultant</u>
1.	Oil Spill Exercise on Ice	Dome	
2.	Ignitor Modifications	Dome	Energetex
3.	Melt Pool Enhancement (Kigoriak)	Dome	
4.	Cold Weather Pumping System	Dome	
5.	Cold Water Disp.	Esso	ER & E
6.	Oil Under Ice Detection	Esso	Remotec
7.	Video Tapes Amundsen Gulf	Dome	Woodward-Clyde
8.	Video Tapes Lancaster Sound	Dome	Woodward-Clyde
9.	Oil Spill Trajectory	Esso	In-House

Time Frame: 1980-1981 program.

Undertaken By: Dome Petroleum Ltd.
(in-house or by contract)

Contact: R.A.W. Hoos Telephone: 403-266-7838
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Dome Petroleum Ltd.
Place 800, 18th Floor
800 - 6th Avenue
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Program: ICE RESEARCH 1980-1981
Beaufort Sea Production Development
Dome Petroleum Limited

Geographic Area: Arctic Marine Areas.

Program Objectives: Research to advance existing technology to develop Dome's Arctic marine exploration and production capabilities, particularly in support of Dome's operations in the Canadian Beaufort Sea.

Projects and Objectives: (1) Monitoring Ice Interaction Against Artificial Islands

A major monitoring programme is being planned to measure ice forces and study ice interaction against the artificial island which Dome and its partners plan to complete during the summer of 1981. The island design incorporates vertical caissons at the water line, so it is ideally suited to the measurement of ice forces.

(2) Impact of Multi-Year Floes Against A Rock Island

During 1980, a very successful program was conducted at Hans Island in the Kennedy Channel between Ellesmere Island and Greenland. The deceleration of large multi-year floes was measured as they collided with the small rocky island. From the measured deceleration, average ice forces were derived.

During 1981 a similar program will be run at Hans Island for a longer period and using improved techniques.

In parallel, basic ice mechanics studies will be done to help to interpret the results from Hans Island and extrapolate the data to other situations.

(3) Ice Rubble Field Studies

Work on this topic will continue through 1981 and will be aimed at better quantifying:

- (1) Rubble building forces
- (2) Rubble geometries and degree of grounding
- (3) Sliding resistance of grounded ice rubble

These issues will be addressed by a combination of field studies, desk studies and model tests.

(4) Ice Ride-Up and Analytical Model

Some simple two dimensional ice ride-up model tests were conducted during 1980. A theoretical model (incorporating these and other results) will be derived to predict ice ride-up phenomenon. This model may be tested by conducting additional model tests and against field observations. Ice ride-up resistant designs of offshore platforms will be developed.

(5) Rationale for Ice Forces and Associated Research

During 1980 a new rationale was developed for structures in deeper water in the Beaufort Sea, where extreme ice features such as ice islands and multi-year hummock fields may occur. The new approach recognized that, for very large structures subject to impact by large ice features, the driving forces rather than local ice failure will probably control the loads on the structure.

This has led to increased emphasis on average pack ice forces over several km, and the forces during ridge building. During 1981 additional research will be conducted on ridge building forces and on the formulation of a local pack ice model for driving forces.

Furthermore research will continue on an ice/soil interaction model. This model is currently being programmed for the computer so that parametric studies using different assumptions and island geometries can be run. Physical testing of the rapid deformation of granular soils may also be needed.

(6) Ice Statistics

Work will continue to better quantify the occurrence and collision probabilities of extreme ice features such as ice islands, multi-year hummock fields, etc. We will participate in industry studies of ice velocities and movement and documentation of annual ice conditions.

(7) Remote Sensing and Ice Forecasting

A large effort continues on remote sensing techniques to assist in ice navigation and extended season drilling. Dome will participate with the Government in new SAR development. A comprehensive ice management system is

Cont:

ICE RESEARCH 1980-1981
Beaufort Sea Production Development
Dome Petroleum Limited

being developed for the 1981 drilling season, including a derrick top radar system and possible use of a tethered balloon as a radar platform.

(8) Kigoriak Ice Breaking Trials 1980

The Kigoriak ice breaking trials were extremely successful proving that the vessel could operate year round in the Beaufort Sea. The ship was tested in all possible operational modes in both multi-year and first-year ice. Tests were also conducted in ridges and extensive ice strength data were taken by Dome and National Research Council Scientists. Tests were also conducted on communications, navigation and remote sensing.

(9) Extreme Ice Features

April 1980 a trip was made to Prince Patrick Island and to Borden Island to observe extreme ice features that occur off the coast of these islands. Ice pile-ups up to 100 feet high were observed off Borden Island and large multi-year hummock fields were observed at different locations down that coast. We feel that we now understand the mechanism for generation of an extreme ice feature and this gives us a good insight into the size of these features.

(10) Ice Floe Tracking

During September 1980 multi-year ice came down from the pack and surrounded the well sites. To aid the drilling operation large ice floes were tracked by means of an Omega ice floe tracking system that was constructed by Dome Petroleum several years ago. A package placed on a large floe received the Omega navigation signals and transmitted the required phase information back to the drillship. This information could be decoded to indicate the location of the floe. The system appeared to work to a range of approximately 30 miles from the drillship but some problems were encountered. Further trials may be conducted this summer. Mathematical models to predict ice floe trajectories have been developed by Dome and used to hindcast the floes trajectories reasonably well. Further work will be conducted in this field.

Cont: ICE RESEARCH 1980-1981
Beaufort Sea Production Development
Dome Petroleum Limited

(11) Ice Scour Research

A considerable number of studies have been conducted over the last 12 months in an attempt to determine the necessary burial depths for pipelines in ice infested waters. New methods involving ice keel and ice scour statistics have been developed which we feel are beginning to lead to safe engineering design criteria.

Reports: Proprietary

Time Frame: Continuing Program - 1980/81 Projects.

Undertaken Operators:

By:
Dome Petroleum Ltd.
(In-house or contract)

Manager:

G.R. Pilkington

Funded
by: Dome Petroleum (or joint industry support).

Contact: R.A.W. Hoos Telephone: 403-266-7838
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800 - 6th Avenue
Calgary, Alberta T2P 0N1

Project: REMOTE SENSING PROGRAM 1980-1981.
Beaufort Sea Production Development
Dome Petroleum Limited

Geographic Area: Beaufort Sea / Arctic Marine Areas.

Projects and Objectives: (1) Derrick-top Radar

This is an experiment to evaluate the performance improvement gained by operating drillship radar from the top of the derrick instead of the top of the bridge.

(2) Aerostat Radar

An aerostat (tethered blimp) will be used as an airborne radar platform to evaluate its potential for operational support.

(3) Radar Processing/Display

This is a "smart" display which converts marine radar data (range/bearing) to an X-Y display format, and performs image enhancement. It is also designed to work with airborne imaging radar.

(4) Shipboard Ice Alert & Monitoring System

This computer-based display and processing system is intended to record ice and related environmental data, and to display actual and predicted ice distributions in the vicinity of drillships for assessment of hazards to operations.

(5) Real Time Surface Current Monitors

These are ocean current meters housed in bottom-anchored buoys which are designed to withstand most summer floe ice, and which will be deployed in the vicinity of drillships.

(6) Summer Ice Model

This is a software model which predicts the motion of ice floes under summer conditions.

Cont: REMOTE SENSING PROGRAM 1980-1981
Beaufort Sea Production Development
Dome Petroleum Limited

(7) Winter Ice Experiment in the Beaufort Sea

A set of ARGOS buoys was deployed on the winter ice pack to provide drift data for comparison with predictions from computer winter ice models.

(8) Floe Tracking System

Radar beacons will be deployed on selected, potentially dangerous floes and monitored from the drillships.

(9) SAR

Dome is currently negotiating for the design and construction of a Synthetic Aperture Radar (SAR) System for use in ice surveillance.

Reports: Proprietary

Time Frame: Continuing Program: 1980-81 Projects.

Undertaken Dome Petroleum Ltd.

By: In-house or by Contract

Contact: R.A.W. Hoos Telephone: 403-266-7838
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Dome Petroleum Ltd.
Place 800, 18th Floor
800 - 6th Avenue
Calgary, Alberta T2P 0N1

Program: GEOTECHNICAL RESEARCH 1980-1981
Beaufort Sea Production Development
Dome Petroleum Limited

Geographic Area: Beaufort Sea

Projects and Objectives: (1) 1980 Geotechnical Field Investigation Program - Beaufort Sea

Over 100 cores were taken and over 3000 km of high resolution shallow seismic surveys were run to obtain more information on the surficial geology of the Beaufort Sea.

The main purposes were: to delineate suitable sand for island construction; to assess foundation conditions at certain locations; to identify shallow hazards such as shallow gas, scours, permafrost, slumping, etc.

(2) 1980 Geotechnical Field Investigation Program - Beaufort Sea

A similar program to the 1980 program will be conducted in 1981.

(3) Model for the Surficial Geology of the Beaufort Sea

GSC is managing this study with the oil companies providing geotechnical data obtained in the Beaufort Sea. The report will describe the current state of knowledge of the sea floor of the Beaufort Sea out to the shelf edge. The report will be public.

(4) Beaufort Sea Seismicity Exposure Study - Part 1

Preliminary assessment of seismic sources in the Beaufort Sea area and development of preliminary design criteria for sand islands. APOA Project Number 179.

(5) Beaufort Sea Seismicity Measurement Program

The project is aimed at gathering more accurate data on seismic activity in the Beaufort Sea area by installation of four seismographs along the Beaufort Sea and one on an offshore island. APOA Project Number 176.

Cont: GEOTECHNICAL RESEARCH 1980-1981
Beaufort Sea Production Development
Dome Petroleum Ltd.

(6) Beaufort Sea Seismicity Exposure Study - Parts II and III

This work is planned for later in 1981 and 1982. It will consist of developing a tectonic model for the area, and integration of the more accurate measurements (from the recently installed seismographs) to develop final seismicity design criteria.

(7) Deep Geotechnical Core at Tarsiut Island

To obtain detailed soil properties down to 1200 feet. Will be used to interpret island geotechnical response and well bore instrumentation measurements.

(8) In-Situ Fill Properties - Existing Islands

To measure in-situ relative densities of hydraulically placed fill. Programs are being conducted at the McKinley Bay island and the Alerk (Esso) island.

Reports: Proprietary Studies (unless otherwise indicated).

Time Frame: Continuing Program - 1980-81 Projects.

Undertaken Operators:

By: Dome Petroleum Ltd. (by contract or in-house)

Funded Dome Petroleum Ltd.
by: (or joint industry support).

Contact: R.A.W. Hoos Telephone: 403-266-7838
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Program: OCEANOGRAPHIC RESEARCH 1980-1981
Beaufort Sea Production Development
Dome Petroleum Limited

Geographic Area: Beaufort Sea

Projects and (1) Currents

Objectives: Water currents under the ice are being measured to better quantify long term erosion of sand islands. Near surface currents are being measured in the summer to correlate their relationship with the winds.

(2) Waves

Based on a recently completed hindcast an environmental prediction model is being used to forecast wave and climate from wind forecasts.

(3) Erosion Mechanisms

Erosion of the slopes of sand islands will be evaluated using model tests and field monitoring programs.

Reports: Proprietary Studies.

Time Frame: Continuing Program - 1980-81 Projects

Undertaken

By: Dome Petroleum Ltd.
In-house or by contract

Contact: R.A.W. Hoos Telephone: 403-266-7838
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800 - 6th Avenue
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Program: RESEARCH PROGRAM FOR CANMAR KIGORIAK, AN EXPERIMENTAL ARCTIC CLASS 4 ICEBREAKER (1979-1980).
Beaufort Sea Production Development
Dome Petroleum Ltd.

Objectives: The overall goal of the Kigoriak research project is to fill the existing major gaps in the data base required for the design and operation of a year-round hydrocarbon production and transportation system for the Continental Shelf regions of Arctic waters.

The Program has been divided into a number of components with the following objectives:

1. Test the design features of the Kigoriak and analyze data for further refinements
2. Develop full-scale ice force design criteria for the design of marine structures in moving pack ice
3. Develop and test an icebreaker tanker pushing system.
4. Develop and improve an all-weather, day or night, pack ice remote sensing system and operational prediction model.
5. Test the feasibility of navigating through various concentrations of multi-year ice representative of Point Barrow and Northwest Passage routes
6. Determine the limits of an icebreaker to minimize ice forces against fixed structures in the moving pack ice.
7. Follow up the winter 79/80 research test program with tests in the summer polar pack and an early winter 80/81 pack ice test.
8. Assess the socio-economic/biological impacts of year round icebreaker operation in the Arctic.

Approach The formal research program began in the winter of 1979/80 and will continue through 1981. Because the Kigoriak has been able to navigate in almost all ice conditions throughout the winter, invaluable data for calculating vessel transit time has been collected. This will facilitate the computation of realistic and defensible transit times for icebreaking tankers operating year round in the Arctic waters.

Data collected to date indicate that design modifications can dramatically improve icebreaker efficiency. This would not have been possible without the test data acquired.

Reports: Proprietary

1. Kigoriak Tests in Pack Ice, October 1979.
2. Kigoriak Tests in 1 m Ice, January 1980.
3. Kigoriak Tests in 1.3 m Ice, February - March 1980.
4. Ice Strength Data Taken During Kigoriak Tests by NRC (non-confidential report)

RESEARCH PROGRAM FOR CANMAR KIGORIAK, AN EXPERIMENTAL ARCTIC
CLASS 4 ICEBREAKER (1979-1980).
Beaufort Sea Production Development
Dome Petroleum Ltd.

5. Ice Friction Measurements on Kigoriak, February and May, 1980.
6. A Finite Element Analysis of the Hull and Nozzle for Kigoriak.
7. Instruments Used on Kigoriak During 1979 - 80 Ice Tests
8. Use of Bow Mounted Impulse Radar to Determine Ice Thickness (non-confidential report)
9. Kigoriak Trip Through the Northwest Passage, September 1979.
10. Final Report of 1979/80 Kigoriak Tests.
11. Evaluation of the Use of Kigoriak for Seismic in Open and Ice Covered Waters.
12. Evaluation of a Photographic Remote Sensing System for Ice Breaker Support

Undertaken

By: _____

Dome Petroleum Ltd.
In-house or by contract

Contact:

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Program: BIOLOGICAL - CHEMICAL RESEARCH 1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

Geographic Area: Beaufort Sea and other Arctic marine areas.

Projects and Objectives: Biological and/or chemical research efforts undertaken or funded by Dome during 1980 included:

1. Biological Concerns Related to Icebreaker Traffic

LGL Limited was retained to carry out aerial transect surveys of seals in the fast ice zone adjacent to McKinley Bay. The primary purpose of the work was to determine the abundance and distribution of seals relative to the January, February and June icebreaker tracks. Shipboard observations of animal behavior and the distribution of seal breathing holes in the old winter tracks were made.

Caulfield Engineering was contracted to carry out an underwater acoustics program to quantify the nature, intensity and zone of influence of sounds produced by the Kigoriak in various modes of operation and ice conditions. The objective was to assess concerns related to underwater sounds and their possible effects upon marine mammals such as whales and seals.

2. Environmental Monitoring of Dredging Activities

McKinley Bay

Arctic Laboratories Ltd. was retained to conduct monthly oceanographic surveys of McKinley Bay and to evaluate the effects of dredging upon the water quality of the region.

The Federal Department of Fisheries attempted to assess the possible effects of dredging upon the fisheries resource, and the Canadian Wildlife Service, in conjunction with Dome Petroleum, carried out bird surveys of the McKinley Bay area throughout the summer.

Tuktoyaktuk Harbour

Arctic Laboratories Ltd. was contracted to investigate water quality conditions in Tuk Harbour in considerable detail throughout the open water season.

Arctic Laboratories Ltd. also carried out a quantitative benthic biological sampling program of Tuktoyaktuk Harbour.

Cont: BIOLOGICAL - CHEMICAL RESEARCH 1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

Dobrocky Seatech Ltd. was contracted to monitor the fisheries resources of the outer Tuk Harbour area (Kugmallit Bay) and their migration patterns, while the Department of Fisheries and Oceans conducted comprehensive work within the immediate harbour area.

Kaglulik and Tarsiut Artificial Islands

Arctic Laboratories Ltd. was contracted to obtain quantitative information on the geochemistry of the marine sediments and the benthic populations in the vicinity of the proposed borrow sites, and island construction sites, before, during and after construction of the islands.

3. Environmental Monitoring of Coal Dust Utilized During Spring Breakout

McKinley Bay and Tuktoyaktuk Harbour approach channel sediments were monitored in 1980 by Arctic Laboratories Ltd. for the possible accumulation of coal dust in areas of active coal dusting.

4. Whale Surveys - Tuktoyaktuk Peninsula

During 1980, the most comprehensive whale survey program ever was undertaken in the Beaufort Region. LGL Limited was contracted by each of the U.S. Bureau of Land Management, Esso and Dome, to perform several different but interrelated tasks.

Dome provided substantial logistical support to the BLM programs. Dome's second commitment was to obtain baseline information concerning the distribution and number of Bowhead whales in the vicinity of the proposed Kaglulik artificial island.

5. Seal Surveys - Beaufort Sea/Arctic Islands

In a joint program with the Canadian Wildlife Service, an aerial survey of seals was conducted between June 21 - July 10, 1980 covering the northern portion of Amundsen Gulf, Prince of Wales Strait, Viscount Melville Sound, Barrow Strait, Western Lancaster Sound, Lougheed Island - Whitefish area through to Norwegian Bay, Western Jones Sound, Penny Strait, Queen's Channel, McDougal Sound and Byam Martin Channel.

Dome and Esso also supported a CWS project to analyze data collected between 1971 and 1979 in the Beaufort Sea on the distribution of seals and polar bears in relation to sea ice,

Cont: BIOLOGICAL - CHEMICAL RESEARCH 1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

habitat types, shore-lead polynyas, and areas in which industrial activities are projected. The purpose of this project is to help establish the relative importance of different areas and habitats to seals and polar bears, for use in evaluating the possible effects of carrying out exploration and production activities in these areas.

6. Bird Surveys - Beaufort Sea to Viscount Melville Sound

A significant sea-bird survey program in the region was carried out with the Canadian Wildlife Service. The specific objectives were to:

- a) record the abundance and distribution of water birds in the polynyas that generally form each spring in the southeastern Beaufort Sea.
- b) conduct an aerial survey that will delineate potentially important bird habitat in littoral areas of Amundsen Gulf, Prince of Wales Strait and Viscount Melville Sound.
- c) ground-truth sites selected for this purpose during the habitat survey.
- d) determine the abundance and distribution of broods and moulting waterfowl (swans, geese and ducks) in coastal marine areas of the southeastern Beaufort Sea from Herschel Island to Cape Bathurst.
- e) conduct a mid-September aerial survey of fall-staging birds in coastal areas of the Beaufort Sea and Amundsen Gulf.

7. Coastal Zone Survey - Prince of Wales Strait to Birdport Inlet

Hardy Associates (1978) Ltd. was retained to carry out a coastal zone survey of the area between Amundsen Gulf and Birdport Inlet.

Woodward Clyde was contracted to obtain a videotape record of a larger area, but including the above area.

Reports:

Biological field reports commissioned by Dome Petroleum from 1979 to 1980: (some are still in draft form).

1. Observations of Marine Mammal and Sea Bird Interaction with Icebreaking Activities in the High Arctic, 1979 - prepared by Hatfield Consultants Ltd.
2. Wildlife Observations made in September 1979 on the Icebreaker Kigoriak between Saint John, N.B. and Tuktoyaktuk, N.W.T. - prepared by MacLaren Marex Inc.

Cont: BIOLOGICAL - CHEMICAL RESEARCH 1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

3. A Histopathological Evaluation of Organisms from Tingmiark K-91, Ukalerk C-50, Ukalerk 2C-50 and Kenalooak J-94 (1979) - prepared by Arctic Laboratories Ltd.
4. Canmar Early Breakout Programme, 1980, Environmental Monitoring of Coal Dust - prepared by Arctic Laboratories Ltd.
5. McKinley Bay Dredging Project, Water Quality Measurements and Dredge Spoil Monitoring, 1980 - prepared by Arctic Laboratories Ltd.
6. An Oceanographic Study of Tuktoyaktuk Harbour, Northwest Territories (1980) - prepared by Arctic Laboratories Ltd.
7. Annotated Bibliography of Pertinent Reports Dealing with the Environmental Impacts of Dredging, Artificial Islands, and Exploratory Drilling in the Beaufort Sea (1980) - prepared by Environmental Sciences Ltd.
8. Distribution of Ringed Seals in Relation to Winter Icebreaking Activities near McKinley Bay, N.W.T., January-June, 1980 - prepared by LGL Limited.
9. Aerial Surveys of Bowheads and other Marine Mammals off the Tuktoyaktuk Peninsula, August-September 1980 - prepared by LGL Limited.
10. Survey of Fish Populations in Kugmallit Bay and Tuktoyaktuk Harbour, Northwest Territories (1980) - prepared by Dobrocky Seatech Ltd.
11. High Arctic Seal distributions, 1980 - prepared by Canadian Wildlife Service.
12. Sea-bird Surveys in the Beaufort Sea, Amundsen Gulf, Prince of Wales Strait and Melville Sound - 1980 Season - prepared by Canadian Wildlife Service.
13. Terrain and Vegetation Analysis of Coastal Areas along Prince of Wales Strait and Viscount Melville Sound - prepared by Hardy Associates Ltd.

Time Frame: 1979-1981

Undertaken Dome Petroleum Ltd.

By: (in-house or by contract/funding support).

Cont: BIOLOGICAL - CHEMICAL RESEARCH 1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

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Program: BEAUFORT SEA PRODUCTION ENVIRONMENTAL STUDIES 1979-1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

Geographic Area: Beaufort Sea and other Arctic marine areas.

Objectives: To collect and update information as required to prepare an environmental impact statement for hydrocarbon production in the Beaufort Sea/Mackenzie Delta region.

Projects: The following projects were in progress or completed during 1979-1980.

1. Beaufort Sea Pollution Zones
2. Biological Impacts of Icebreaking
3. Environmental Baseline Data - Kopanoar Specific, Beaufort Sea General
4. Biological Baseline Data - Prince of Wales Strait, Western Viscount Melville Sound
5. Oceanographic Baseline Data Collection Program - Amundsen Gulf, Prince of Wales Strait, Viscount Melville Sound.
6. Environmental Impact Assessment Management and Planning - Kopanoar Development
7. Ecology of the Southern Beaufort Sea and Mackenzie River Delta: An Annotated Bibliography
8. Preparation of Environmental Impact Statement - Preliminary Beaufort Sea Development Phase
9. Environmental Impact Source Documents
10. An Engineering and Environmental Study of the Use of Explosives in Ice

Additional information in attached: "Project information Table".

Reports: Generally proprietary

Time Frame: 1979-1980

Undertaken By: Dome Petroleum Ltd.

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PROJECT INFORMATION TABLE
BEAUFORT SEA PRODUCTION ENVIRONMENTAL IMPACT STUDIES -
1979-1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

PROJECT 1: BEAUFORT SEA POLLUTION ZONES
A study of waste disposal regulations in relation to spatial and temporal differences in the sensitivity of Beaufort Sea Marine Resources.

Objectives: To conduct an historical review of the existing regulations and an assessment of Dome/Canmar's experiences in complying with or changing the regulations during their Beaufort Sea Operations.

Reports: Historical Review and Assessment of Canmar's Environmental Operating Conditions (EOC's) for Drilling in the Beaufort Sea.
- Proprietary.

PROJECT 2: BIOLOGICAL IMPACTS OF ICEBREAKING

Objectives: To obtain and evaluate data on:

- (a) The nature, frequencies and carrying distances of noises generated by icebreaking activities and their possible effects on wildlife.
- (b) The likelihood of direct physical contact between the icebreaker and wildlife, particularly ringed seal pups.
- (c) The effects of icebreaking on marine mammal and bird ice habitat.
- (d) The possibility of whale entrapment in artificial leads.

PROJECT 3: ENVIRONMENTAL BASELINE DATA - KOPANOAR SPECIFIC, BEAUFORT SEA GENERAL

- Objectives:
- (a) Monitor the distribution, numbers and movements of bowhead and beluga whales.
 - (b) Repeat the aerial enumeration surveys for seals and birds as described by Sterling and Barry.
 - (c) Re-examine the significance of lead utilization by sea birds and mammals.
 - (d) Update chemical baseline data respecting the level of contaminants in the water column, sediments and biological tissues.

Cont: PROJECT INFORMATION
 BEAUFORT SEA PRODUCTION ENVIRONMENTAL IMPACT STUDIES -
 1979-1980
 Dome Petroleum Ltd.

PROJECT 4: BIOLOGICAL BASELINE DATA - PRINCE OF WALES STRAIT, WESTERN
 VISCOUNT MELVILLE SOUND

- Objectives:
- (a) To obtain baseline information regarding the distribution, abundance and significance of major bird and marine mammal species frequenting the region.
 - (b) To obtain baseline information regarding the characteristics of the coastal zone and the delineation of important habitats and potentially sensitive areas.

- Approach and/or Progress:
- (a) A regular census will be undertaken of the major bird and mammal species frequenting the Prince of Wales Strait/Viscount Melville Sound region utilizing standard aircraft reconnaissance and enumeration techniques.
 - (b) The coastal zone of the region will be investigated utilizing standard airphoto interpretation, aerial reconnaissance and ground-truthing techniques.

PROJECT 5: OCEANOGRAPHIC BASELINE DATA COLLECTION PROGRAM

Geographic Area: Amundsen Gulf, Prince of Wales Strait, Viscount Melville Sound

- Objectives: To collect sufficient surface current and ice drift data to gain a preliminary understanding of currents and driving forces in these waters.

- Approach and/or Progress:
- (a) Collect basic weather data at four locations: Amundsen Gulf, north and south Prince of Wales Strait and Western Viscount Melville Sound.
 - (b) Collect ice movement data during breakup by deploying two RAMS/ARGOS buoys; one in Viscount Melville Sound the other in Prince of Wales Strait.
 - (c) In July, August, September, deploy arrays (total of 15) surface current drogues, in open water, in Prince of Wales Strait and Viscount Melville Sound to obtain surface current data. The drogues will automatically transmit their position via satellite.

Cont: PROJECT INFORMATION
BEAUFORT SEA PRODUCTION ENVIRONMENTAL IMPACT STUDIES -
1979-1980
Dome Petroleum Ltd.

PROJECT 6: ENVIRONMENTAL IMPACT ASSESSMENT MANAGEMENT AND PLANNING
Kopanoar Development

Objectives:

1. Plan and manage a conceptual and preliminary environmental impact assessment for all components related to the Beaufort Sea Production Project.
2. Do in-house documentation and preparation for presenting impact assessment results.

PROJECT 7: ECOLOGY OF THE SOUTHERN BEAUFORT SEA AND MACKENZIE RIVER
DELTA: AN ANNOTATED BIBLIOGRAPHY

Objectives:

1. To prepare an annotated bibliography that will serve as a summary of published and unpublished ecological information and will aid in the identification of potential impacts to biota from oil and gas development in the Canadian Beaufort Sea and part of the Mackenzie River Delta.
2. The most relevant information within each chapter of the bibliography is to be summarized to give a clear impression of the present state of knowledge.
3. Information needs relative to general impact assessment are to be outlined with reasons stated.

PROJECT 8: AN ENGINEERING AND ENVIRONMENTAL STUDY OF THE USE OF
EXPLOSIVES IN ICE.

Objectives:

- (a) To determine the effectiveness of blasting ice ridges prior to a ship's passage.
- (b) To determine the environmental effects of blasting in ice.

Program: OCEANOGRAPHIC AND SEA ICE RESEARCH 1979-1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

Geographic Area: Beaufort Sea and other Arctic marine areas.

Projects and Objectives: The following list of projects were in progress or completed during 1979-1980.

More detailed information is provided on separate "Project Information Table".

- Ice Pile-up and Ride-up Project - 1980
- Multi-Year Hummock Field Study
- Ice Island Survey
- Purchase and Analysis of Staellite Imagery for Sea Ice Analysis
- Acoustic Ice Thickness Profiler
- Under Ice Ridge Keel Profiling Study

Reports: Generally proprietary.

Undertaken By: Dome Petroleum Ltd.
(In-house or by contract)

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PROJECT INFORMATION TABLE
 OCEANOGRAPHIC AND SEA ICE RESEARCH 1979-1980
 Beaufort Sea Production Development
 Dome Petroleum Ltd.

PROJECT 1: ICE PILE-UP AND RIDE-UP PROJECT 1980.

Objectives: Oceanographic and Sea Ice Research: To get a better understanding of the ice pile-up and ride-up process which will allow more accurate prediction of the effects of pile-up and ride-up on offshore and onshore marine facilities.

Approach and/or Progress: The approach will be to do a large number of field observations of pile-up and ride-up on natural features. Model tests will be used to expand and extrapolate from the field observation and to plan the field investigations.

PROJECT 2: MULTI-YEAR HUMMOCK FIELD STUDY

Objectives: Oceanographic and Sea Ice Research.

- a) To study the frequency of occurrence of multi-year hummock fields (MYHF) in both the Beaufort Gyre and the southern Beaufort Sea, to measure their size and related parameters, and calculate their probability of encounter in the drilling zone and the expected forces associated with such encounters.
- b) Learn to identify MYHF's positively from the air using stereo photography, backed up by a ground truthing program.
- c) Determine the distribution of MYHF's both as a product of their relative position off the N.W. coast of the Canadian archipelego, as well as their latitude-related distribution.
- d) Determine salinities, ages and engineering properties of MYHF.

Approach and/or Progress:

- a) A Study of five sites of multi-year floes. Various types were surveyed and their thicknesses estimated by drilling. In addition, ice interaction at floe boundaries was studied.
- b) A study of multi-year ice activity off the west coast of Prince Patrick Island. The heavily hummocked My floes were studied, and their origin and maximum sizes

Cont: PROJECT INFORMATION
 OCEANOGRAPHIC AND SEA ICE RESEARCH 1979-1980
 Beaufort Sea Production Development
 Dome Petroleum Ltd.

determined. Hence, their probability of encounter in the Southern Beaufort Sea may be calculated.

- c) Aerial photography of the three regions off Banks, Prince Patrick and Ellesmere Islands both close to the pack edge and at some depth into the pack, to determine My floe sizes, % My cover, floe roughness and to detect any unusual ice features. This will add to the statistical data base.
- d) Deployment of two single headed, upward-looking sonar units off the west coast of Banks Island to gain statistical data on My keels moving into the drilling zone under the influence of the Beaufort Sea.

PROJECT 3: ICE ISLAND STUDY

Objectives: Oceanographic and Sea Ice Research:

Phase 1

- a) To establish the feasibility of (and optimum operating parameters for) future large scale surveys.
- b) To achieve unambiguous identification of ice islands on Side Looking Airborne Rader (SLAR).

Phase 2

- a) To count the number of ice islands that presently exist in the Beaufort Sea.
- b) To record the size distributions of the ice islands.
- c) To determine the possibility of new ice islands calving off the ice shelves.
- d) To determine the growth rate of the ice shelves and so predict the future source of ice islands.

Approach
and/or
Progress:

Phase 1 will establish the feasibility of (and optimum operating parameters for) the large scale survey. The initial study will catalogue ice island appearance on SLAR imagery as it varies due to 'operational' parameters and to inherent differences in ice surface.

Cont: PROJECT INFORMATION
OCEANOGRAPHIC AND SEA ICE RESEARCH 1979-1980
Dome Petroleum Ltd.

Phase 2 will involve an ice island count by examining SLAR flights by AES and, an ice shelf study. Aerial photos will be used to analyze size of and cracks in the shelves. Growth rate will be investigated through a field study.

PROJECT 4: PURCHASE AND ANALYSIS OF SATELLITE IMAGERY FOR SEA ICE ANALYSIS.

In the past decade a number of United States space satellites have taken a multitude of pictures of the earth's surface. Spacecraft of the National Oceanic and Atmospheric Administration (NOAA) have provided small scale images of large areas while the Landsat craft of the National Aeronautics and Space Administration (NASA) have provided larger scale pictures of more localized areas. These satellite pictures have preserved for us objective "bird's eye views" of sea ice in years past-ice which, in most cases was never subjected to on-the-spot ground surveys.

Objectives: Oceanographic Sea Ice Research:

The final product will be the first phase of a report summarizing the ice conditions of each polar area showing some hydrocarbon potential.

Approach
and/or
Progress:

Satellite images are to be purchased and studied to determine normal and extreme ice behaviour statistics. The satellite data are to be used together with existing ice charts and climatological summaries. The report will be presented on an area-by-area basis.

PROJECT 5: ACOUSTIC ICE THICKNESS PROFILER

Objectives: Oceanographic and Sea Ice Research:

- a) Develop a fast, ground-borne system to measure sea ice effectively, and estimate its 'quality'.
- b) Do further field work to record data on magnetic tape rather than on paper tape.
- c) Minimize the electronics required to estimate the depth and wave velocity.
- d) Develop the mathematical algorithm to analyse the returning echoes in real time.

Cont: PROJECT INFORMATION
 OCEANOGRAPHIC AND SEA ICE RESEARCH 1979-1980
 Beaufort Sea Production Development
 Dome Petroleum Ltd.

e) Increase public awareness of this technique.

Approach
and/or
Progress: An acoustic unit was developed by Caulfield Engineering of Edmonton and a field trial was done in March 1980.

Further field work will be done in order to record data on magnetic tape, to develop the efficiency of the electronics, and to extend mathematical representations in this research where the basic physics are yet unknown.

PROJECT 6: UNDER ICE RIDGE KEEL PROFILING STUDY

Objectives: Ice features such as ridges and ice islands present the greatest obstacles to drillships, production platforms, subsea production systems and shipping in the Beaufort Sea. A better knowledge of distributions of keel depths is required in order to optimize future design of such systems.

Approach
and/or
Progress: The data collected using this system is objective, and not dependent on interpretation.

The data includes:

- 1) Complete keel profiles for the 250 days of deployment.
- 2) Mean monthly ice thicknesses.
- 3) Histograms of keel maxima in monthly increments.
- 4) Maximum recorded keel depth.
- 5) Ice type identification and level of confidence in identification.
- 6) Monthly ice cover data.
- 7) The mean monthly ice thickness (compared to field sampling tests).
- 8) Keel probability function.
- 9) Ice growth and its relationship to the dynamics and snow cover.
- 10) Sail-to-keel ratio (based on large statistical data base).
- 11) Time lost by hypothetical drillship pushed off the site.

Reports: Proprietary
 Hardware Installation Report APOA #147 Report.

Program: OIL SPILL RESEARCH - 1979-1980
Oil Spill Prevention/Cleanup/Impact Prediction: Recent
Studies 1979-80
Beaufort Sea Production Development
Dome Petroleum Limited

Geographic Area: Beaufort Sea and other Arctic marine areas.

Objectives: Research on all aspects of oil spill/prevention, cleanup and environmental impacts of oil spill - in relation to the ice-covered waters of the Arctic marine environments.

Projects: The following list of projects were in progress or completed during 1979-80.

1. Offshore Production Oil Spill Analysis
2. In-Situ Combustion of Oil Slicks Against Ice Edges
3. Oil and Gas Under Sea Ice - Phase 2 and 3
4. Arctic Tanker - Oil Spill Analysis
5. Fireproof Boom Development - 1979
6. Bacterial Degradation, Literature Study
7. Oil Spill Contingency Plan - Production
8. Literature Study on Bird Deterrent Techniques - Dyes
9. Air Deployable Ignitor Tests - Phase I
10. Air Deployable Ignitor Improvements
11. Mechanical Oil Recovery Systems in Ice
12. Development of a Portable Burner

Addition information in attached "Project Information Table".

Reports: Generally proprietary

Undertaken By: Dome Petroleum Ltd.
(in-house or by contract/funding support)

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Cont: PROJECT INFORMATION TABLE
OIL SPILL RESEARCH 1979-1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

PROJECT 1: OFFSHORE PRODUCTION OIL SPILL ANALYSIS
Oil Spill Research Program 1979-80, Dome Petroleum Ltd.

Objectives: Oil Spill Research -

1. to analyze the proposed Arctic offshore production systems,
2. to investigate past offshore production oil spillages with the purpose of determining the underlying cause and frequency of occurrence,
3. to recommend design, equipment and/or operational features that should be included to substantially reduce or eliminate the spillage of oil into the Beaufort Sea.

Approach/
Progress: Phase 1. Based on historical data of past offshore production system spills, including but not limited to blowouts, process equipment failures, transfer spills, pipeline ruptures, leakages, fuel spills, and chronic discharges, the consultant will:

- document the incidents,
- determine the underlying cause of the incident, if possible, and
- prepare a statistical summary of the incidents based on such variables as well location, production output, facility type and age, spill size and the operation underway at the time the incident occurred.

Phase 2. Utilizing a number of the better documented incidents that have been identified in Phase 1 an analysis will be carried out to:

- identify the subsequent failures that resulted in the discharge of hydrocarbons into the sea.
- identify design, equipment and/or operational features that could have been incorporated in the production facility that would have prevented or reduced the size of the spill.
- determine features that should be included in Dome's Arctic Production systems.

PROJECT 2: IN-SITU COMBUSTION OF OIL SLICKS AGAINST ICE EDGES
Oil Spill Research Program 1979-80, Dome Petroleum Ltd.

Objectives: Oil Spill Research to investigate situations in the Arctic when oil slicks are partially or completely confined as they apply to in-situ burning of oil slicks.

Cont: PROJECT INFORMATION TABLE
OIL SPILL RESEARCH 1979-1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

- a) For aged oil slicks herded against obstacles by wind, to relate slick thickness and slick size (parallel to the wind) to wind speed.
- b) To determine the effects of wind speed, slush ice and waves on the combustion characteristics and efficiency of oil herded by wind against obstacles.
- c) To determine the combustion characteristics of oil and oil-snow mixtures in ice cracks at low temperatures.

Approach/
Progress:

Phase 1: Wind Herding

Experiments to correlate wind speed with the average thickness and size of oil slicks windherded against obstacles.

Phase 2: Combustion of Wind-Herded Slicks

Some of the initial experiments should be performed using obstacles made of ice. If the ice seriously affects the combustion process, the majority of experiments should involve the use of ice. Combustion experiments at a variety of wind speeds and obstacle heights.

Phase 3: Combustion at Very Low Temperatures in Cracks

Undertake combustion experiments on the Beaufort Sea Crude and summer diesel in slots cut into an ice cover using two oil thicknesses in the slot, and oil-snow mixtures with 10%, 20% and 50% snow by weight. Undertake combustion experiments close to 0°C, -20°C, and -40°C.

Reports:

Related reports:

- a) Ignition and Burning of Crude Oil on Water Pools under Arctic Springtime Conditions - May 1977. Proprietary
- b) Some Aspects of Weathering and Burning of Crude Oil in Water-and-ice Environment - August 1976. Proprietary
- c) Development of a Continuously Burning Wicking Device for Burning Oil Slicks - October 1978. Proprietary
- d) Testing of our Deployable Incendiary Devices for Igniting Oil on Water - March 1978. Proprietary
- e) Air Deployable Oil Spill Ignitor Test - Yellowknife - May 14, 1979. Proprietary

Cont: PROJECT INFORMATION TABLE
OIL SPILL RESEARCH 1979-1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

PROJECT 3: OIL AND GAS UNDER BEAUFORT SEA ICE STUDY
Oil Spill Research Program 1979-80, Dome Petroleum Ltd.

Background

A fairly clear picture is emerging of the factors which affect the ignitability of oil as it migrates through ice. The ignitability depends on whether or not the oil can be heated to a temperature above its fire point. If it can, it burns. The oil temperature depends on the oil thickness and on the nature of the igniting device. The fire point depends on the oil properties, especially the degree to which it has been weathered (evaporated) which in turn depends on the slick thickness, temperature, wind speed, and time. Generally, thick pools weather less (keep lower fire points) and are easier to heat. The feasibility of burning can thus be determined if information on the oil history as it migrates to the surface is available (data on thickness, weathering rates, etc.).

Objectives: Oil Spill Research to conduct a field experiment to determine how successful burning would be as a countermeasure and to optimize burning techniques for oil and gas released from a blowout under first year ice.

The experiment has the following main goals:

- a) Understand how the oil behaves in the ice, and especially what effect gas has on the rates at which the oil migrates to the surface in the spring.
- b) Determine if emulsions will form, and if so, when and how.
- c) Understand how the oil accumulates on the melting ice, i.e., the thickness, degree of weathering and area.
- d) Determine, if possible, the optimum time for burning the oil.
- e) Devise and test under realistic conditions, devices which can ignite the oil.
- f) Measure how much oil is burned, and how much remains as a residue.

Approach/
Progress: The approach is to discharge crude oil and gas beneath Beaufort Sea ice during two different periods of the winter (early December and early March) and to monitor the subsequent results.

Phase 1. Discharge of oil under broken first-year ice.

Cont: PROJECT INFORMATION TABLE
OIL SPILL RESEARCH 1979-1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

Phase 2. Discharge of oil under solid first year ice.

Phase 3. Monitoring of oil migration to the surface.

Testing of aerial and land deployed ignition devices and promoters at appropriately defined times.

Reports: Proprietary

- a) Ignition and Burning of Crude Oil on Water Pools under Arctic Springtime Conditions - May 1977. Proprietary
- b) Some Aspects of Weathering and Burning of Crude Oil in a Water-and-ice Environment - August 1976. Proprietary
- c) Development of a Continuously Burning Wicking Device for Burning Oil Slicks - October 1978. Proprietary
- d) Testing of our Deployable Incendiary devices for Igniting Oil on Water - March 1978. Proprietary
- e) Air Deployable Oil Spill Ignitor Test - Yellowknife May 14, 1979. Proprietary
- f) Oil and Gas Under Ice Laboratory Study - Acres Consulting. Proprietary
- g) Progress Reports for Phases 1, 2, and 2A - D.F. Dickins. Proprietary

PROJECT 4: ARCTIC TANKER - OIL SPILL ANALYSIS
Oil Spill Research Program 1979-80. Dome Petroleum Ltd.

Objectives: To determine what would have happened in past major oil tanker spills, around the world, had the tanker been a Class 10 Arctic Ice Breaking Super Tanker.

Approach/
Progress: Based on actual data for tanker oil spills exceeding 200 tons (1140 barrels), and occurring during the period January 1, 1973 to the present, an analysis was carried out for each case involving either a collision and ramming, grounding, explosion or fire, material failure, catastrophe, intentional, etc. to determine what would have happened (what quantity of oil if any, would have been spilled) if the tankers involved had been of Arctic Class 10 construction.

Cont: PROJECT INFORMATION
OIL SPILL RESEARCH 1979-1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

Reports: Arctic Tanker Oil Spill Analysis, Det Norske Veritas, 1979 -
Proprietary.

PROJECT 5: FIREPROOF BOOM DEVELOPMENT
Oil Spill Research Program 1979-80. Dome Petroleum Ltd.

Objectives: In-situ burning has great potential as an oil spill countermeasure in the Arctic. Studies have shown that it is possible to burn oil on water provided that the oil can be contained in a thick enough layer. To thicken the oil, it is necessary to use a boom.

The objective of this study is to develop a fireproof boom that could be used to contain and thicken the oil released from an oil well blowout so that it could be ignited and burned in-situ at the blowout site over an extended period of time.

Approach/ Phase 1: "Material Identification and Selection".
Progress: Identification and selection of materials suitable for constructing a fireproof boom of the desired characteristics. The properties of the different suitable materials will be documented.

Phase 2: "Boom Design"
Design of a boom which will satisfy required fireproof characteristics, containment under stated wave height and towing conditions, compactness, handling and modification criteria.

Phase 3: "Prototype Construction and Testing"
Manufacture of and testing of two prototype sections of the best design of the boom including testing the fireproof boom characteristics and the towing and anchoring behaviour of the boom. Preliminary tests should include oil burns within the boom and monitoring of the resulting temperatures. Further tests should include testing under design wave conditions.

Reports: The Development of a "Quickie" Fireproof Boom, McAllister Engineering, 1979. Proprietary.

PROJECT 6: BACTERIAL DEGRADATION, LITERATURE STUDY
Oil Spill Research Program 1978-80. Dome Petroleum Ltd.

Cont: PROJECT INFORMATION TABLE
OIL SPILL RESEARCH 1979-1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

Objectives: A novel technique for the disposal of oil on oil contaminated shorelines (also on open water), that has surfaced recently, is the use of bacteria-based oil spill clean-up products.

The objectives here are to:

- a) document through laboratory work the feasibility of using native indigenous bacteria versus "commercial cocktails" to clean up oil contaminated shoreline areas in the Arctic.
- b) document the areas in the Arctic where bacterial degradation may be used as an oil spill countermeasure.
- d) to examine the possibilities of the "greenhouse" effect on speeding up the bacterial degradation processes.

Approach/
Progress: Laboratory tests with both "commercial cocktail" and the native indigenous bacterial population common to the Beaufort Sea area will be carried out using shoreline samples from the Beaufort Sea and Beaufort Sea crude oil as another control parameter in the laboratory experiments.

PROJECT 7: BEAUFORT SEA OIL SPILL CONTINGENCY PLAN - PRODUCTION
Oil Spill Research 1974-80. Dome Petroleum Ltd.

Objectives:

- a) To develop a contingency plan to deal with oil spills originating from production facilities and tanker transport in the Arctic.
- b) To identify potential oil spill R & D projects as related to production and transportation in the Arctic.
- c) To delineate the equipment for oil spill countermeasures in the Beaufort Sea.

Approach/
Progress: Prepare an oil spill contingency plan based on Canmar's proposed production facilities and tanker transportation requirements; and through the development of this contingency plan, identify potential problems for future R & D work.

PROJECT 8: LITERATURE STUDY ON BIRD DETERRENT TECHNIQUES
Oil Spill Research Program 1979-80. Dome Petroleum Ltd.

Objectives: Oil Spill Research:

- (1) To investigate and document the use of dyes and coloured objects to deter the various types of waterfowl

Cont: PROJECT INFORMATION
OIL SPILL RESEARCH 1979-1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

encountered in Arctic waters from oil infested leads/polynyas in the springtime.

- (2) To conduct the necessary field trials, in the Arctic, to verify any major findings and/or conclusions of objective (1).

Approach/Progress: A literature study on the use of coloured dyes and coloured objects for deterring birds and other wildlife species as well as all bird behavioural studies pertaining to the responses of birds to coloured materials was conducted. Ornithologists who have been or who are presently engaged in the testing of coloured dyes and waterbird behaviour were consulted.

Reports: Dyes and Colored Objects: An Evaluation of Their Use in Deterring Birds from Entering Oil Infested Leads and Polynyas in the Beaufort Sea. Proprietary.

PROJECT 9: AIR DEPLOYABLE IGNITOR TESTS
Oil Spill Research Program 1979-80. Dome Petroleum Ltd.

Objectives: Oil Spill Research

- (a) To determine the feasibility of deploying the ignitors from a helicopter.
- (b) To determine the optimum deployment heights for the ignitors from a helicopter.
- (c) To investigate the effectiveness of using air deployable ignitors on the disposal of crude oil contained on melt pools.

Approach/Progress: A small quantity of oil sufficient to form a five millimeter slick over a representative melt pool of no more than 30 square meters was spilled. The site was chosen on a lake near Yellowknife that was environmentally acceptable to the Environmental Protection Service and the N.W.T. Water Board. After spilling oil on the water surface to a suitable thickness, a series of tests was conducted using one ignitor at each of two altitudes ranging from 15 to 35 meters.

Reports:

- (1) Testing of Air Deployable Incendiary Devices for Igniting Oil on Water (by Energetex Engineering), Final report of test results. Proprietary
- (2) Oil Spill Tests - Yellowknife, N.W.T., May 14, 1979 - by D.F. Dickens Engineering. Proprietary.

Cont: PROJECT INFORMATION
OIL SPILL RESEARCH 1979-1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

PROJECT 10: AIR DEPLOYABLE IGNITOR IMPROVEMENTS
Oil Spill Research Program 1979-80. Dome Petroleum Ltd.

- Objectives:
1. To improve the present prototype air deployable ignitor for ignition of confined oil slicks so that:
 - (a) the size and weight of the ignitor are decreased while maintaining the same relevant efficiency.
 - (b) Aerodynamic stability of the ignitor is increased so as to permit the ignitor to land in the correct position within the target area when deployed from a moving helicopter.
 - (c) the lighting procedure for the fuse wire, from a moving helicopter, is simplified.
 2. To test and evaluate the modified air deployable ignitor both in static and air deployment tests, on fresh and aged oil slicks.

- Reports:
- Proprietary
- (a) Ignition and Burning of Crude Oil on Water Pools under Arctic Springtime Conditions - May 1977. Proprietary
 - (b) Some Aspects of Weathering and Burning of Crude Oil in a Water-and-Ice Environment - August 1976. Proprietary
 - (c) Development of a Continuously Burning Wicking Device for Burning Oil Slicks - October 1978. Proprietary
 - (d) Testing of our Deployable Incendiary Devices for Igniting Oil on Water - March 1978. Proprietary
 - (e) Air Deployable Oil Spill Ignitor Test - Yellowknife - May 14, 1979. Proprietary

PROJECT 11: MECHANICAL OIL RECOVERY SYSTEMS IN ICE
Oil Spill Research Program 1979-80. Dome Petroleum Ltd.

- Objectives:
- To investigate the feasibility of developing four (4) novel mechanical oil recovery concepts for oil-in-ice in the Beaufort Sea. These four concepts are:
- (a) Oil Mop. Develop an oil mop system for the recovery of oil under, and in, moving Arctic ice.
 - (b) Ice Washing. Develop an oil ice-washing processor that could be mounted on a specially designed Arctic ice reinforced recovery vessel.

Cont: PROJECT INFORMATION
OIL SPILL RESEARCH 1979-1980
Beaufort Sea Production Development
Dome Petroleum Ltd.

- (c) Underwater Vacuum Cleaner. Develop an underwater vacuum cleaner that could be directed by a small submarine, and could be used to recover the oil under moving Arctic ice.
- (d) Use of Present Mechanical Systems. Investigate the feasibility of using:
 - (1) augers to release oil from under the ice for recovery with pumps, etc.
 - (2) trenching apparatus in conjunction with specially designed booms to divert oil for recovery and/or in-situ burning.

PROJECT 12: DEVELOPMENT OF A PORTABLE OIL BURNER (APOA #159)

Objectives: Oil Spill Research

Phase 1

- (1) To do a literature survey on emulsion to establish how they form, their properties, if and how they will form in the Arctic, methods of containment, methods of disposal.
- (2) To carry out small scale controlled experiments, with Beaufort Sea oil, as required to augment the findings of objective (1).

Phase 2. To design, develop and test a portable oil burner for the disposal of oil and water-in-oil emulsions.

Approach/
Progress:

Phase 1. The literature survey concentrates on the formation, behaviour and disposal methods of water in oil emulsions in both fresh and salt water environments (0 to 10°C) as found in the MacKenzie Bay region of the Beaufort Sea.

Using Beaufort Sea crude oil, or an oil having the same anticipated properties, laboratory studies are being conducted to determine the emulsion formation tendency of Beaufort Sea crude oil and also to determine the density, viscosity, dispersibility, pour point, fire point and ignitability of the emulsion.

Phase 2. This phase of the study pursues the design, development and testing of a portable oil burner that will be able to meet specified design criteria.

Reports: Development of Oil Disposal Techniques at Remote Sites on Land and Water. Proprietary.

Program: CASE STUDIES DIRECTED TOWARDS DEFINING MAJOR PHYSICAL AND CHEMICAL FLUXES AND DETERMINING CHEMICAL MASS BALANCES FOR THE BEAUFORT SEA IN GENERAL.

Objectives: To establish a relative perspective between the natural input and removal (sources, sinks, and residence times) of substances as opposed to man-induced influences on the Beaufort Sea in general.

Approach/
Progress: Case Studies initiated or planned.

- (i) The input of natural and anthropogenic substances to the Beaufort Sea - a chemical mass balance study.
Contract: Seakem Oceanography Ltd. Jan/81 - March/81:
Scientific Authority Dr. R.W. MacDonald (IOS)
- (ii) The impact of dredging in the Beaufort Sea - A chemical mass balance study.
Contractor (to be decided) (Joint with industry)
- (iii) Dredging and Beaufort Sea biology - A case study.
Contract: Joint with industry.
Scientific Authority: Dr. E. Grainger ABS/DFO.
- (iv) Fish in the Beaufort Sea.
Contract Joint with industry.
Scientific Authority: Dr. E. Grainger ABS/DFO
- (v) Four years of monitoring a large point source input of drill mud at Tarsuit: - A chemical mass balance case study.
Contract: Seakem Oceanography Ltd. Mar/81 - Jun/81.
Scientific Authority: J.A.J. Thompson (IOS) or M. Waldichuk (PEI/DFO)
- (vi) Major oilwell blowouts and marine oil spills - A chemical mass balance case study.
Contract: Joint with industry.
Scientific Authority: Dr. W.J. Gretney (IOS) and Dr. J. Vandermeulen (BIO).

Time Frame: Continuing

Undertaken
By: Ocean Information Division
Institute of Ocean Sciences, Fisheries and Oceans Canada

Research Co-ordinator: B.D. Smiley, R.H. Herlinveaux

Contact: Dr. A.B. Cornford Telephone: 604-656-8335
Ocean Information Division
Institute of Ocean Sciences
Sydney, B.C. V8L 4B2

Program: REVIEW AND ASSESSMENT OF EXISTING DATA FOR THE MARINE SCIENCE DISCIPLINES IN THE BEAUFORT SEA HYDROCARBON PRODUCTION AREA.

Geographic Area: Western Arctic

Objectives: To initiate a quality controlled and integrated multidisciplinary data base and to identify critical data gaps.

Approach/Progress: The following projects have been initiated or planned:

1. (i) Compilation, quality assessment and appraisal of last 30 years' physical oceanographic data for S.E. Beaufort Sea.
Contract: Arctic Sciences Ltd. (D. Fissel) Nov. 15/80 -Mar/81
Scientific Authority: Dr. H. Melling (IOS)
(ii) Delineation of water masses on the Tuktoyaktuk Shelf.
(Under consideration pending outcome of 1st contract).
2. (i) Computing support for processing CANMAR drillship SE Beaufort Sea oceanographic 1976-1979 data.
Computer funding to Arctic Sciences Ltd. (in progress).
(ii) Computing support for atmospheric data processing to derive Beaufort Sea surface wind patterns from IOS data.
Computer funding to Arctic Sciences Ltd. (in progress).
3. (i) Compilation, quality assessment, and appraisal of existing chemical oceanographic data for the SE Beaufort Sea
Contract: Arctic Laboratories Ltd. (D. Thomas):
Jan/81-Mar/81:
Scientific Authority: Dr. R. Macdonald.
(ii) Evaluation of physical and chemical parameters required for archiving chemical oceanographic data sets for the arctic.
(Planned joint OID/industry contract to follow 1st contract).
4. (i) Feasibility study to evaluate relevant combinations of physical, chemical and biological parameters for archiving biological oceanographic data sets and setting guidelines for both general and specific ecological studies.
Contract: Phase I: (Joint OID/Industry)
(ii) Compilation, quality assessment and appraisal of existing SE Beaufort Sea biological oceanographic data for archiving, and major data gaps.
Contract: Phase II: (Joint OID/Industry)

Time Frame: As indicated

Undertaken Ocean Information Division
By: Institute of Ocean Sciences, Fisheries and Oceans Canada

Joint OID/Industry contracts

Contact: Dr. A.B. Cornford Telephone: 604-656-8335
Oceanographic Information Division
Institute of Ocean Sciences
Sydney, B.C. V8L 4B2

Program: Ocean Information Division, Beaufort Sea Studies

Geographic Area: Western Arctic

Objectives: Supply interpretation of, and advice on, aspects of ocean systems (physical, chemical and biological) from IOS experts in relevant fields in response to requests.

Provision of marine information, advice and expertise for environmental assessment and review including input to EARP (Environmental Review and Assessment Process) and the preparation of Environmental Impact Statement (EIS) (e.g. Beaufort Sea Proposal)

Management and/or conduct of specific marine environmental reviews or environmental quality research projects designed to meet specific purposes.

Approach and/or Progress: Numerous marine baseline studies (e.g. the 1974-75 Beaufort Sea Project) have been conducted by both industry and government, along with considerable recent effort to compile comprehensive annotated bibliographies (most specifically relating to biological studies).

Using a common geographical and presentation format, effort has been initiated to compile and appraise the quality of existing physical and chemical oceanographic data for the Beaufort Sea and its environs. Based upon the existing good quality data from both of these initial studies, preliminary chemical oceanographic data sets will be compiled incorporating comments on their validity for specific uses - focussing primarily at major Beaufort Sea industrial concerns arising from large-scale dredging, major oil spills, etc.

Formulation of meaningful and generally acceptable biological data sets is several orders of magnitude more difficult. Efforts have been commenced to assess how to define useful biological data sets, what criteria should be used and what parameters or proxy data should be included. When resolved, a compilation and quality assessment of available arctic data based upon the procedure and format used for the physical and chemical studies will be commenced.

In the short term, parts of the good quality physical and chemical data sets in combination with case studies are being applied towards defining major physical and chemical fluxes and determining chemical mass balances for the Beaufort Sea in general. The underlying purposes are to establish a relative perspective between the natural

inputs and removal (sources, sinks and residence times) of substances as opposed to man-induced influences on the Beaufort Sea in general.

The scientifically based scenarios and case studies provide the physical/chemical order-of-magnitude basis for attempting assessment of biological effects. Estimates of projected levels of industrial activity and infrastructure are required. Further research will be required augmented by some key monitoring. The proposed process should assist design of such future research directions.

Projects:

The following projects are currently in progress or planned:

Review and assessment of existing data for the marine science disciplines in the Beaufort Sea hydrocarbon production area. (P.I.S. 13)

Case studies directed towards defining major physical and chemical fluxes and determining chemical mass balance for the Beaufort Sea in general. (P.I.S. 11)

Preparation of a Beaufort Sea production overview/scenario. B. Smiley.

SE Beaufort Sea circulation & heat budget; analysis of CANMAR drillship 1976-1979 C70 data.
(Under consideration OI.D. prepared to contribute to computing, scientific direction and control).

Completion of final Beaufort Sea Project

Summary Report (Fishes, Invertebrates, Seaweeds....)
B. Smiley

Publishing of "The influence of circulation on the distribution of chemicals in the Beaufort Sea"

Support to an 18-month study of the ice flora and phytoplankton at Issungnak Island in the S. Beaufort Sea - A supplement to the Esso physical/chemical research program. (OI.D. support to DSS. Unsolicited proposal by Arctic Laboratories. To be confirmed. Scientific Authority. Dr. E.H. Grainger.)

Undertaken Oceanographic Information Division
By: Institute of Ocean Sciences, Fisheries & Oceans Canada
(In-house and by contract)

Research Coordinators: B.D. Smiley, R.H. Herlinveaux

Contact: Dr. A.B. Cornford Telephone: 604-656-8335
Oceanographic Information Division
Institute of Ocean Sciences
Sydney, B.C. V8L 4B2

Project: NORTHLANDS ECOREGIONS

Geographic Yukon and Northwest Territories

Area:

Objectives: Through a working group comprised of various northern researchers and administrators, delineate and describe the areal extent of ecoregions north of 60°; to provide on a 1:3,000,000 map base, a broad perspective of the land resource base and environmental conditions.

Approach/ Ecological Land Classification approach.
Progress:

Reports: Wiken, E. et al. 1980. Ecoregions of the Northern Yukon. Lands Directorate, Ottawa, Ontario. K1A 0E7

Wiken, E. et al. 1978. An Ecological Land Survey of the Northern Yukon. Tech. Rpt. Lands Directorate, Ottawa, Ontario. K1A 0E7

Oswald, E. and J. Senyk. 1977. Ecoregions of Yukon Territory. Rpt. BC-X-164, Canadian Forestry Service, Victoria, British Columbia. V8Z 1M5

Time Frame: First approximation for the entire territories is due for the fall of 81.

Undertaken Northlands Ecoregions Working Group
By: Canada Committee on Ecological Land Classification
Lands Directorate, Environment Canada

Research Personnel - A. Hodgson, K. MacInnes, E. Oswald, J. Senyk, C. Tarnocai and E. Wiken.

Contact: E. Wiken, Chairman Telephone: 819-997-2320
LANDS DIRECTORATE
Ottawa, Ontario
K1A 0E7

Project: ECODISTRICT MAPPING FOR THE NORTHWEST TERRITORIES

Geographic Area: Northwest Territories

Objectives: Through an interdisciplinary team of researchers, to plot and characterize the areal and ecological differentiation of terrestrial areas throughout the Northwest Territories; the information base will cover themes such as soils, landforms, vegetation, aquatic and wildlife; a map base of 1:1,000,000 will be used and the resulting information package will be entered and stored in the Canada Land Data System.

Approach and/or Progress: The ecological land classification system will be followed: data gathering will involve a synthesis of existing information, remote sensing analysis and limited field studies.

Reports: Wiken, E. et al. 1980. Multistage Remote Sensing In Exploratory Ecodistrict Land Classification. 6th Canadian Symposium on Remote Sensing, Halifax, Nova Scotia.

Wiken, E. et al. 1980. Ecodistrict Information for Northern Management. Victoria Workshop on Ecological Data Processing and Interpretation, Resource Analysis Branch, Victoria, British Columbia.

Time Frame: Ecodistrict map units to be plotted by March 82 and descriptive coding to be completed by March 83; data base is being incrementally established throughout this two year period and as such certain individual 1:1,000,000 map sheets will be finished prior to the more overall total project completion date of March 83.

Undertaken By: Ecological Land Classification and Evaluation Division
Lands Directorate, Environment Canada

Research Personnel - D. Welch, G. Ironside, C. Rubec, T. Pierce and E. Wiken.

Contact: Ed Wiken, Telephone: 819-997-2320
Lands Directorate
Ottawa, Ontario
K1A 0E7

Project: ECOLOGICAL BASELINE INFORMATION SYSTEM FOR THE BEAUFORT SEA PLANNING AREA

Geographic Area: Beaufort Sea Areas bound by the NTS 1:500,000 map sheets 117SW and 117SE, 107SW and 107SE, 97SW and 97SE, 97NW and 97NE and 98SW and 98SE.

Objectives: To establish an environmental information system structured within a semi-detailed ecodistrict land classification; to interpret and assess the information in support of regional planning decisions.

(Information gathered will cover soils, aquatics, wildlife, vegetation, coastal properties and unique or outstanding features).

Approach/Progress: Ecological land classification system; emphasis of this study will be on the synthesis and simplification of the existing knowledge for the area.

Time Frame: Information base to be organized and entered into the Canada Land Data System by March 82; interpretative aspects and computer handling will be emphasized in the early part of fiscal year 82-83.

Undertaken By: Ecological Land Classification and Evaluation Division
Lands Directorate, Environment Canada

Research Personnel: D. Welch, and E. Wiken

Contracted by: Prairies and Northern Region
Environmental Conservation Service
Edmonton, Alberta

Contact: Ed Wiken or David Welch Telephone: 819-997-2320
Lands Directorate
Ottawa, Ontario K1A 0E7

Project: SURFICIAL GEOLOGY AND GEOMORPHOLOGY
MACKENZIE BAY-CONTINENTAL SHELF

Geographic Area: Beaufort Continental Shelf including
Mackenzie Bay and eastern extension into Amundsen Gulf

Objectives: To resolve the stratigraphic and structural relationships of the unconsolidated surficial marine sediments of the Beaufort Continental shelf to provide the geological framework necessary for: the delineation of permafrost; the assessment of offshore aggregate supplies; the establishment of engineering design criteria for offshore structures for petroleum exploration and production; the resolution of the Quaternary history of the shelf area; the identification of sedimentary and geomorphic processes operating on the shelf; and to continue development of the technology necessary to conduct surficial marine geological surveys in ice covered areas of the Arctic and in shallow coastal waters.

Reports: S.M. Blasco, 1978. Unmanned submersible probes Arctic shore zone. Coastline of Canada Conference, May 1-3, 1978, Halifax, N.S.

S.M. Blasco, 1978. Preliminary cruise report: Beaufort Sea and Amundsen Gulf: 1978. Internal report submitted to Bedford Institute, Canadian Hydrographic Service (West Coast) and Ministry of Transport (West Coast).

Blasco, S.M. 1980. Surficial geology of Amundsen Gulf Current Research, March 1980.

Blasco, S.M., Lewis, C.F.M. and B.R. Pelletier, 1980. Surficial geology of the Beaufort Sea and continental shelf edge. Current Research, March 1980.

Hunter, J.A. and S.M. Blasco, 1979. Review of high resolution marine geophysics in Canada. Proceeding of First Canadian Marine Geotechnical Conference, April 1979

O'Connor, M., MacLeod, N. and S.M. Blasco, 1979. Surficial geology of the southern Beaufort Sea. Proceedings of First Canadian Marine Geotechnical Conference, April 1979.

Time Frame: 1970 - continuing

Undertaken By: Atlantic Geoscience Centre
Environmental Marine Geology Subdivision
Geological Survey of Canada, EMR

Project Leader: Blasco, S.M.

Contact:

S.M. Blasco

Telephone: 902-426-2694

Geological Survey of Canada

Atlantic Geoscience Centre

Bedford Institute of Oceanography

P.O. Box 1006

Dartmouth, Nova Scotia

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Project: COASTAL RECONNAISSANCE OF THE SVERDRUP BASIN, N.W.T.

Geographic Area: Sverdrup Basin, N.W.T.

Objectives: To map and analyze the coastal environments of the Sverdrup Basin, N.W.T. To provide information on the shore types, processes and the effects of massive shore ice piles which will serve as background information for the evaluation of potential marine terminal sites and the impact of such installations on the coastal zone.

Approach Progress: The proposed project is a field oriented study which is to extend Arctic coastal observations to the Sverdrup Islands.

The objectives are to provide information on the effects of ground and sea ice on geomorphic and sedimentary processes in the coastal zone; on pertinent data required for the evaluation of potential marine terminal sites; representative coastal areas needed for subsequent mapping of all the coasts of Sverdrup Islands using airphotos.

Field observations were carried out using both helicopter and all terrain cycle along parts of King Christian, Ellef Ringnes, Cameron and Cornwall Islands during July and August 1978.

Analysis of the field data was completed in 1979. Six main morphological coastal types were distinguished in the central Sverdrup Basin. The low sandflat coast was the most common. All of the shores are part of a low wave energy, microtidal environment where longshore transport of sediment is minimal. Eleven coastal sites were recommended as potential marine terminals. From these, the best potential site was chosen for each of the four islands examined.

A compilation of coastal maps for the islands of the central Sverdrup Basin was begun in 1980 by an outside contractor under the supervision of the project leader. Using the previously collected field data as ground truth, three sets of maps at a scale of 1:125,000 were completed using a map legend applicable to the study area.

Reports: 1. Taylor, R.B., 1980. Coastal reconnaissance for marine terminal planning in the Sverdrup Basin, N.W.T. Submitted to Strategic Studies Branch, Transport Canada, 150 pp.

Also submitted to the Geological Survey of Canada, Open file 549, 1981.

2. A series of coastal maps of Loughheed, King Christian, S. Ellef Ringnes, S. Amund Ringnes and Cornwall Islands at a 1:125,000 scale.
3. Coastal Aerial Photography (35 mm slides) of King Christian, South Ellef Ringes, Cameron and Cornwall Islands taken in 1976 and 1978.
4. E.H. Owens, R.B. Taylor, M. Miles, and D.C. Forbes. 1981. Coastal Geology Mapping: An Example from the Sverdrup Lowland, District of Franklin; in Current Research, Part B. Geological Survey of Canada 81-1B, pp. 39-48.
5. Coastal maps and aerial photography (35 mm slides) were completed for N.E. Bathurst Island and Grinnell Peninsula, Devon Island, NWT in 1980. Maps were at 1:125,000 scale.

Time Frame: Ongoing.

Undertaken by: Atlantic Geoscience Centre,
Environmental Marine Geology, Coastal Geodynamics
Geological Survey of Canada, Dept. of Energy, Mines &
Resources.
Project Leader - R.B. Taylor
Other Participants - E. Bryant, Atlantic Geoscience Centre;
Transportation Development Agency.

Funded by: Energy, Mines and Resources, and the Transportation
Development Agency, Transport Canada

Contact: R.B. Taylor Telephone: 902-426-7726
Atlantic Geoscience Centre
Geological Survey of Canada
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia B2T 4A2

Project: COASTAL RECONNAISSANCE OF BYLOT AND
N.E. BAFFIN ISLANDS, N.W.T.

Geographic Area: Northwest Territories, District of Franklin.

Objectives: To map and analyze the coastal environments of Bylot and N.E. Baffin Island, N.W.T. To provide information on the shore types, sediments and processes affecting the shoreline stability which will serve as background information for the evaluation of effects of offshore drilling in Lancaster Sound in the event of a well blowout.

Approach Progress: The proposed project is field oriented which is to extend Arctic coastal observations to Bylot and N.E. Baffin Island. The objective is to provide information on the magnitude of wave energy and other processes affecting the stability of these shores and how it relates to other Arctic islands already studied.

Field work was completed during August-early September 1979 and August 1981. Observations of coastal morphology and processes were completed along N-NE Bylot Island, in the vicinity of the village of Pond Inlet and along NE Baffin Island as far south as 71° 31' North latitude.

Beach sediment characteristics, the height of debris lines and storm ridges, and observations during a three day storm all showed that wave energy experienced along the shores at the entrance to Lancaster Sound is a much greater magnitude than along Barrow Strait. The northeast shore of Bylot Island appears to be receding and there is a relative scarcity of beach sediments except adjacent to deposits of glacial debris.

Beach thaw depths were recorded and rates of erosion of ice-bonded sediment during storm conditions were computed. These calculations are based on the first known field observations of ice-bonded sediment erosion collected in the eastern Arctic.

Reports: P. McLaren, W.B. Barrie, J.M. Sempels, R.A. Sieffert, R.B. Taylor and D. Thomson. 1981. Coastal Environmental Data from Eastern Lancaster Sound and Northeastern Baffin Island, N.W.T., B.I.O. Data Series B1-D-81-1, 283 pp.

Time Frame: Ongoing

Undertaken By: Atlantic Geoscience Centre
Environmental Marine Geology, Coastal Geodynamics.

Geological Survey of Canada, Dept. Energy, Mines & Resources..

Project leader - R.B. Taylor

Other Participants - Petro Canada Ltd; P. McLaren, P. Frobel
and B. Barrie - Atlantic Geoscience Centre, Hydrographic
Service, Tidal Section.

Funded
by:

Energy, Mines & Resources
and Petro Canada (partial funding).
Polar Continental Shelf Project (Logistics)

Contact:

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Telephone: 902-426-7726

Project: COASTAL EROSION - SEDIMENTATION, NORTHERN SOMERSET ISLAND, N.W.T.

Geographic Area: Somerset Island, N.W.T.

Objectives: To map the modern sedimentary environments of the coasts of northern Somerset Island and adjacent islands with particular reference to the processes controlling erosion, transportation and deposition of sediments and the role of permafrost and sea ice movement. To provide basic data that will help assess the impact of the various human activities on the natural balance of processes with particular reference to gas pipeline concerns.

Approach Progress: The proposed project "Coastal erosion-sedimentation, northern Somerset Island" is a field oriented study of the rates and intensities of erosive and sedimentary processes relating to an Arctic sea ice and permafrost environment.

During 1974 a general reconnaissance of the entire coastal strip was made with detailed work and bench marks to be established. During 1975 and 1976 detailed observations of investigation will be completed along the coasts of Barrow Strait with special reference to Somerset, Bathurst, Lowther, Russell and S.W. Devon Islands.

During 1979-80, an office study to analyze previously collected field data was carried out. Attention was focused on the seasonal fluctuations of beach thaw and the effect of permafrost on coastal processes in the Arctic. It represents the first detailed study of the beach thermal regime and rates of thaw on coarse sediment beaches in the eastern Arctic Islands. Thaw beneath the beach foreshore zone is directly related to the salinity and temperature of the nearshore water and because of the presence of brine the thaw characteristics are much different than beneath the beach backshore zone. The ice-bonded sediment prevents large scale changes to the coast during storm wave conditions because of its resistance to erosion.

Reports: Taylor, R.B., 1979. Beach thaw depths: seasonal and short term fluctuations, Canadian Arctic Islands (abstract) submitted to N.R.C. Canadian Coastline Conference.

Taylor R.B., 1980. Beach thaw depth and the effect of ice-borded sediment on beach stability, Canadian Arctic Islands; in Canadian Coastal Conference 1980, Proceedings NRC, pp 103-121

Taylor R.B., 1980. Coastal Environmental along the northern shore of Somerset Island, District of Franklin; in the Coastline of Canada, S.B. McCann, editor; Geological Survey of Canada, Paper 80-10, pp 239-250.

Time Frame: Ongoing.

Undertaken Atlantic Geoscience Centre
By: Environmental Marine Geology, Coastal Geodynamics
Geological Survey of Canada
Dept. Energy, Mines & Resources.
Project Leader - R.B. Taylor

Contact: R.B. Taylor Telephone: 902-426-7726
Atlantic Geoscience Centre
Geological Survey of Canada
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
B2Y 4A2

Project: ESTABLISHMENT OF ENVIRONMENTAL DESIGN PARAMETERS FOR BEAUFORT SEA DEVELOPMENT - GEOTECHNICAL INFORMATION REQUIREMENTS.

Geographic Area: Beaufort Sea.

Purpose: "In-house" evaluation of the nature and stability of the Beaufort seabed in terms of providing background for:

- a) approval of industry production proposals for the Beaufort Sea;
- b) the provision of technical advice relating to production and development regulations and guidelines;
- c) evaluation of the forthcoming Esso/Gulf/Dome Environmental Impact Statement (EIS).

An Ad Hoc Beaufort Geotechnical Evaluation Group (BGEG) has been formed.

In consideration of the requirements of the Preliminary Federal Offshore Production and Development Guidelines, and in response to research suggestions proposed by the Beaufort Sea Seabed Synthesis Project (Ad Hoc APOA group concerned with seabed geology and the synthesis of Esso/Gulf/Dome/Government data for the resolution of potential seabed problems), and an awareness of the geotechnical aspects of the upcoming EIS document, the following research projects under OERD Program 7 are considered for fiscal year 1981/82.

Seismicity

Application of OBS (Ocean Bottom Seismometer) technology to seismic risk analysis - experimental test program.

Ice Scour

Evaluation of scour depths/return periods and parameters by regional/mosaic studies and paleoscour analyses.

Geologic Correlation

Integration of Government/Esso/Gulf/Dome seabed data for delineation and engineering implications of the Quaternary history of the shelf and slope (including borehole/acoustic correlations, shallow gas, pingos, faulting, sea level history, model development, etc.).

Sediment Dynamics

Sediment transport, erosion and deposition on the seabed with implications to offshore structure (i.e. erosion of the toe of artificial islands; fate of dredge sites).

Geotechnical

Evaluation of the geotechnical properties of seabed including new technology development; seabed stability analyses (i.e. shelf edge slumping).

Permafrost

- a) Refraction mapping of permafrost including new technology development.
- b) Acoustic properties of permafrost.
- c) Correlation of distribution and degree of ice bonding between reflection acoustics and borehole data including correlation with geologic history and new technology development.

Geothermal

Evaluation of the thermal properties and detailed definition of the thermal regime of seabed in relation to permafrost and hydrates.

Aggregate

Research relating to the evaluation of the volume and grade of offshore aggregate material for engineering development.

Hydrates

Research relating to the identification and mapping of hydrates.

Time Frame: 1981-1984

Undertaken Government of Canada
By:

Funded National Energy Program
by: Office of Energy Research and Development

Contact: S.M. Blasco Telephone: 902-426-2694
Beaufort Coordinator
Geological Survey of Canada, EMR
Bedford Institute of Oceanography
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Dartmouth, N.S.
B2H 4A2

Project: WORKSHOP ON THE IMPACT OF THE DEMPSTER CORRIDOR ON THE MACKENZIE DELTA.

Geographic Area: Yukon and Mackenzie Delta.

Objectives: The purpose of the workshop was to identify and appraise the likely impacts of the proposed pipeline from the Delta to Whitehorse along the Dempster and Klondike Highways.

Approach Progress: The Panel considered the pipeline, gas plants, compressor stations, oil and gas exploration and the consequential support activities. The workshop was conducted in 1979 and some important points can be taken from it:

- 1) In accessing socio-economic impacts, the people following the native mode and those following the industrial mode cannot be lumped together because the impacts are often opposite.
- 2) In the category of what we called "Management" which includes various government and native organizations, the service conventionally being provided to the residents will break down and become inadequate and, to a lesser degree, this will apply to the infrastructure.
- 3) One of the most serious biophysical effects is the reduction of land in its natural state and the native residents feeling that they are no longer in control of their destiny - that they are only pawns in an activity controlled from outside. We discuss this under "Ownership".
- 4) Despite the fact that some definite project activities will not be built on land, the big impacts will be caused by what we term as "Consequential Support Activities".
- 5) Without a comprehensive land and water use plan, it is almost impossible to control the activities.

Reports: Impact of the Dempster Corridor on the Mackenzie Delta. Report on a Workshop held by the Alaska Highway Pipeline Panel.

Undertaken By: Alaska Highway Pipeline Panel
Chairman: C.H. Templeton

Contact: C.H. Templeton Telephone: 204-943-1556
C.H. Templeton & Associates, Consultants
710 - 363 Broadway Avenue
Winnipeg, Manitoba R3C 3N9

Program: PHYSICAL OCEANOGRAPHIC PROGRAM - ATLANTIC OCEANOGRAPHIC LABORATORY, OSS ATLANTIC.

Contact: Dr. G.T. Needler Telephone: 902-426-7456
Director
Atlantic Oceanographic Laboratory
Bedford Institute of Oceanography
Dartmouth, Nova Scotia B2Y 4A2

TABLE OF PROJECTS:

SURFACE AND MIXED LAYER OCEANOGRAPHY

Objectives: To study those processes that physically transfer heat, salt, momentum, and gases across the ocean surface and promote exchanges between the mixed layer and the deeper ocean, and generate surface waves and currents; to measure such transfers and exchanges and to interpret the results where appropriate in terms of the local or large-scale ocean climate; to create climatological summaries of near-surface properties such as waves; to study the formation, decay, and motion of sea ice; and to provide advice on near-surface transport of oil and other pollutants.

Project 1: ATMOSPHERIC FLUXES: ARCTIC POLYNA EXPERIMENT

Objective: To measure the sensible heat exchange at the surface of a small Arctic Polyna (open-water area surrounded by ice) and to assess the importance of a small percentage of open areas in determining the surface heat loss from ice-covered oceans.

Time Frame: Ongoing

Undertaken DFO, OSS Atlantic, Atlantic Oceanographic Laboratory
by: S.D. Smith and R.J. Anderson

Project 2: ATMOSPHERIC FLUXES: BEAUFORT SEA HEAT BUDGET

Objective: To use oceanographic and meteorological data collected near drilling rigs in the Beaufort Sea in order to develop a model for the prediction of the onset of winter freezing.

Undertaken DFO, OSS Atlantic, Atlantic Oceanographic Laboratory
by: E.G. Banks and S.D. Smith

Project 3: WAVES: WAVE CLIMATE STUDIES

Objective: To establish for the North Atlantic, and in particular for the Canadian coastal and northern waters, reliable monthly, annual and long-term sea state descriptions based on synoptic wave charts issued by the Meteorological and Oceanographic Weather Centre, Halifax.

Undertaken by: DFO, OSS Atlantic, Atlantic Oceanographic Laboratory
H.A. Neu

Project 4: SURFACE CURRENTS: OIL TRAJECTORY ANALYSIS

Objective: A broad program to improve the capability to track and predict the movement of oil on the continental shelf.

Undertaken by: DFO, OSS Atlantic, Atlantic Oceanographic Laboratory
D. Lawrence, J.A. Elliott and D. Greenberg

Project 5: SURFACE CURRENTS: ICEBERG DRIFT TRACK PREDICTION

Objective: To develop a numerical model which computes iceberg drift given the size and mass of an iceberg and local winds and currents.

Undertaken By: DFO, OSS Atlantic, Atlantic Oceanographic Laboratory
E.G. Banks and S.D. Smith

Project 1: LABRADOR SHELF AND SLOPE STUDIES

Objectives: To provide an accurate, modern description of the temperature, salinity and velocity fields in and near the Labrador Current. To define the distribution of water masses transport of heat and salt, and mixing across the Labrador Shelf.

Approach/
Progress: Analysis of current meter moorings, CTD profiles and nutrient distributions.

Time Frame: Ongoing.

Undertaken
by: DFO, OSS Atlantic
Atlantic Oceanographic Laboratory
Dr. J. Lazier

Project 2: LONG-TERM SURFACE VELOCITY PATTERNS IN BAFFIN BAY AND DAVIS STRAIT

Objective: To determine velocity patterns of the surface layer from daily ice floe positions shown in satellite pictures.

Approach/
Progress: Transparent positives of satellite pictures for the years 1978-1979 were compared, and ice floe movement in Baffin Bay, Davis Strait and Hudson Strait were determined for each week.

Report: BIO Report BI-R-81-4, March 1981

Time Frame: Completed

Undertaken
by: DFO, OSS Atlantic
Atlantic Oceanographic Laboratory
Mr. H. Neu, F. Jordan

Project: MARINE POLLUTION CHEMISTRY

Objectives: To determine the nature and extent of oceanic pollution by chemical contaminants and to define their sources, modes of introduction and fate, including the conduct of baseline surveys, the continuous improvement of sampling and analytical capabilities for marine contaminants, and the conduct of impact studies.

Approach/
Progress: Components of the program relevant to the Arctic include:

Organic Contaminants:

Chlorinated Hydrocarbons - R. Pocklington and J. Leonard
Investigations of the concentrations of DDT and its derivatives and polychlorinated biphenyls in sediments of both Atlantic and Arctic regions of Canada as part of a research program sponsored by the Ocean Dumping Control Act administration.

Dissolved low Molecular Weight Hydrocarbons - E. Levy and P. Jones.

The detection and measurement of light hydrocarbon gases in solution in seawater as an aid to the survey of potential natural hydrocarbon seeps in the eastern Canadian Arctic.

Petroleum Residues in the Eastern Canadian Arctic - E. Levy.
Baseline measurements of petroleum hydrocarbon residues in seawater indicated some abnormalities in the vicinity of Scott Inlet. Further field work is planned to provide more specific information on the location of the seep and the chemical nature of the seeping material. Thereafter Arctic baseline surveys will be extended to the Northwest Passage and Grand Banks.

Reports: Campbell, J.A. and P.A. Yeats. The Distribution of Mn, Fe, Ni, Cu and Cd in the waters of Baffin Bay and the Canadian Arctic Archipelago. Deep-Sea Research, in press.

Jones, E.P. and A.R. Coote, 1980. Nutrient Distribution in the Canadian Archipelago: Indicators of Summer Water Mass and Flow Characteristics. Journal of Fisheries and Aquatic Sciences, 37, 589-599.

Levy, E.M., 1980. Background Levels of Petroleum Residues in Baffin Bay and the Eastern Canadian Arctic: Role of Seepage. Invited Paper PETROMAR 80, International Conference and Exhibition, Petroleum in the Marine Environment, Monaco, May, 1980, in press.

Levy, E.M., 1979. Further Chemical Evidence for Natural Seepage on the Baffin Island Shelf. Current Research Part B., Geological Survey of Canada, Paper 79-LB, 379-383.

Levy, E.M. Transfer Processes and the Global Distribution of Petroleum Pollution in the Marine Environment. Invited Paper, LAPSO Symposium on Marine Pollutant Processes, XVII IUGG General Assembly, Canberra Australia, Dec. 1979, Elsevier Oceanography Series, in press.

Lord, G. and R. Pocklington. Transport Atmospherique et Echange Atmosphere-Ocean de Composes Organiques a l'Etat de Traces. Journal de Recherches Atmospheriques, in press.

Loring, D.H., J.M. Bowers, G. Seibert, and K. Kranck. Report of OAS Activities Associated with the Belledune Project. OIC Belledune Emergency Organization, DFO, in press.

MacLean, B., R.K.H. Falconer, and E.M. Levy. Geological, Geophysical and Chemical Evidence for Natural Seepage off the Northeast Coast of Baffin Island. Bulletin of Canadian Petroleum Geologists, in press.

Time Frame: Ongoing.

Undertaken Atlantic Oceanographic Laboratory
By: Chemical Oceanography Program
Ocean and Aquatic Sciences, Atlantic
Dept. Fisheries and Oceans

Contact: Dr. G.T. Needler Telephone: 902-426-7456
Director
Atlantic Oceanographic Laboratory
Bedford Institute of Oceanography
Dartmouth, Nova Scotia B2Y 4A2

Project: APOA PROJECTS - GENERAL

Geographic Area: Canadian Arctic

Objectives: Most APOA research has been directed towards obtaining engineering and environmental data, and towards adapting techniques and equipment to meet the unique operating conditions of the arctic.

Reports: In some cases the results of APOA research projects are released immediately, while in other cases the reports are released after a 5 year protected period.

APOA bibliography - Second Edition. Oct. 1980. ASTIS Occasional Publication No. 1. The Arctic Institute of North America.

This bibliography contains all APOA conducted or APOA funded research reports in the ASTIS data base as of October 1980 (250 documents). All reports in the bibliography have been released to the public.

Description of Research Projects - A Hand Book. The May 4/79 update brought the number of projects in the handbook to 155. This book provides a description of the report; the operator of each project; table of contents of reports; and indication of reports which are confidential.

A list of projects showing the project number, operator, number of participants, title, status, total cost and cost to the next participant is included.

As of January 1981, the number of projects proposed, in progress or completed was 179.

APOA Review. A quarterly newsletter which published articles on APOA's operations as well as summaries of APOA projects. APOA reports available for purchase and new APOA reports are included in each issue.

Project Identification: The majority of the first 100 APOA projects have been completed and the reports released. Listings of reports and abstracts are available as indicated above.

For the purposes of "Current Programs" (approximately 1978 - or ongoing) a list of APOA projects 100 - 179 follows (with operator and status).

Reference: APOA Description of Research Projects - A Handbook. List of projects - Updates May 4/79 and January 19/81.

APOA

Projects:

No - Operator; Description; Status.

- 103 - Imperial; Study of interaction between ice sheets & wide structures; Completed
- 104 - Imperial; Conduct in-situ ice pressure measurements around artificial islands in Southern Beaufort Sea - Phase I; Completed.
- 105 - Imperial; Conduct in-situ ice pressure measurements around artificial islands in Southern Beaufort Sea - Phase II; Completed.
- 106 - Imperial; Continuous crushing of an ice sheet by a circular indenter; Completed.
- 107 - Dome; Open water burning of oil; Completed
- 108 - Dome; Burning an oil blowout plume; Completed
- 109 - Imperial; Modelling of ice pile-up and ride-up on islands; Completed.
- 110 - Imperial; Design studies of conical and cylindrical bottom founded structures for Southern Beaufort Sea; Completed.
- 111 - Imperial; Ice defense systems experimental evaluation; Completed.
- 113 - Imperial; Statistical study of passage into Beaufort Sea via Point Barrow; Completed.
- 114 - Dome; Preliminary tests of bird scare devices in Beaufort Sea; Completed.
- 115 - Imperial; Polar bear research; In Progress.
- 117 - Suncor; Statistical study of ice thickness from seismic data-1976; Completed
- 118 - Panarctic; Arctic Islands winter ice movement study 1976/77; Completed.
- 119 - Esso; Remote detection of oil in/under ice; In progress.
- 121 - Suncor; Multi-year pressure ridge study Arctic Islands; Deferred.
- 122 - Esso; In-Situ ice pressure measurements 1976/77; In progress.
- 123 - Esso; Continuous crushing of ice 1976/77; In progress.
- 124 - Esso; Experimental study of ice pile-up; In progress.
- 125 - Esso; Experimental ridge CRI interaction 76/77; Completed.
- 126 - Esso; Biological review of Davis Strait; Released.
- 127 - Esso; Davis Strait biological sampling analysis and observations; Released.
- 128 - Esso; Davis Strait pack ice studies 1976-77; Released.

- 129 - Esso; Davis Strait ocean current measurements and analysis 1976; Completed.
- 130 - Dome; Design studies of production structure for the Southern Beaufort Sea; Completed
- 131 - Gulf; Feasibility study of a bottom mounted under ice profiling system (Phase I); Completed.
- 132 - APOA; Instrumentation of drilling fluid sumps; Proposed.
- 133 - Gulf; Investigation of sea-bed scouring in the Beaufort Sea (Phase III); Completed.
- 134 - Esso; Biological and oceanographic study - Davis Strait area; Released.
- 135 - Esso; 1976 Biological surveys - Davis Strait; Released.
- 136 - Dome; Shorelines study - Southern Beaufort Sea; Released.
- 138 - Esso; Davis Strait environmental program - Second half 1977; Released.
- 139 - Gulf; Development of an ice movement monitoring system in the Beaufort Sea; Proposed.
- 140 - Esso; Proposal to conduct Davis Strait pack ice incursion 1977-1978; In Progress.
- 141 - Dome; Ignition and burning of crude oil on water pools under Arctic spring time conditions; Completed.
- 142 - Suncor; Statistical study of late winter ice thickness distribution in the Arctic Islands from seismic data 1977; In Progress.
- 143 - Esso; Model experiments to determine the forces and behaviour of moving ice fields against a concrete drilling caisson; Completed.
- 144 - Esso; Caisson retained island & ice ridge interaction studies.
- 145 - Esso; design report for a caisson retained island; Completed.
- 146 - Esso; 1978 Davis Strait biological programme; Released.
- 147 - Dome; Ice keel profiling in the Beaufort Sea; Completed.
- 148 - Esso; 1978 proposal to conduct studies of continuous crushing of ice with a segmented indenter; In progress.
- 149 - Esso; Oilspill and iceberg studies conducted for preparation of an Environmental Impact Assessment for Davis Strait; Released.
- 150 - Petro-Canada; Ice scour model tests; Completed.
- 151 - Gulf; Analysis of 1978 Beaufort Sea side scan sonar records for sea bottom scouring; In progress.
- 152 - Gulf; Beaufort Sea permafrost completions; Completed.
- 153 - Dome; In Situ gas hydrates survey; Completed.
- 154 - Gulf; High resolution ice tracking system - Beaufort Sea, Phases II & III, Buoy construction and deployment; In progress.

- 155 - Esso; Davis Strait pack ice characterization; Proposed.
- 156 - Esso; Ice island studies 78/79; In progress.
- 157 - Dome; Trace metal characterization in barite from drilling operations; In progress.
- 158 - Gulf; Beaufort Sea repetitive scour mapping '79; Proposed.
- 159 - Dome; Portable oil burner; In progress.
- 160 - Dome; Fireproof boom development; In progress.
- 161 - Dome; Literature study bacterial degradation; Proposed.
- 162 - Under ice bubbler test; Proposed.
- 163 - Dome; Literature study bird deterrent techniques-Dyes; In progress.
- 164 - Dome; Air deployable igniter tests; Completed.
- 165 - Dome; Air deployable igniter improvements; In progress.
- 166 - Dome; In-Situ combustion of oil slicks against edges; Proposed.
- 167 - Dome; Mechanical oil recovery systems in ice; Proposed.
- 168 - Polar bear detection & deterrent devices; Proposed.
- 169 - Dome; Oil and gas under Beaufort Sea ice study; In progress.
- 170 - Gulf; A 1979 investigation of grounded rubble piles in the Beaufort Sea.
- 171 - Gulf; A 1980 investigation of ice conditions & ice behaviour around the Issungnak.
- 172 - Esso; 1978 Davis Strait weather/sea state buoy program and forecasting studies; Completed.
- 173 - Esso; Ecology of the Southern Beaufort Sea and Mackenzie River Delta: An annotated bibliography; In progress.
- 174 - Suncor; Statistical study of late winter ice-thickness distribution in the Arctic Islands from seismic data 1978/1979/1980; Proposed.
- 175 - Dome; Development of acoustic ice-thickness profiles; In progress.
- 176 - Dome; Beaufort Sea seismicity measurement programme; In progress.
- 177 - Esso; Ice rubble model tests; In progress.
- 178 - Dome; Ridge building model tests; In progress.
- 179 - Dome; Preliminary assessment of seismic sources and seismicity of Canadian Beaufort Sea and preliminary evaluation of potential behaviour of sand islands during earthquakes.

Project: ARCTIC MARINE OILSPILL PROGRAM

Geographic Area: Arctic Areas

Objectives: The Arctic Marine Oilspill Program is a technology program with the objective to develop oilspill countermeasures for Arctic waters.

Approach Progress: AMOP endeavors to carry out feasibility studies, equipment design work and in some cases, development of the prototype system (AMOP Project listing - table 1).

Reports: Proceedings, AMOP Workshops.

Time Frame: 1976-1981.

Undertaken By: The Environmental Protection Service is responsible for the over all management of AMOP, with most of the coordinating work carried out by the Environmental Emergencies Branch. Much of the AMOP work is carried out through private sector contracts.

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Director, Environmental Emergencies Branch
Environmental Protection Service
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Table 1 - Overview and Scenario Studies AMOP PROJECT LISTING: TABLES 1 - 9
(Project; Objectives; Time Frame; Contractor and Report Status).

Arctic Atlas; Collect relevant background information; 1977-78; Fenco-Slaney; Pub. No. 9-EC-78-1

Logistics Study; Collect relevant Arctic logistics data; 1977; DeLeuw Cather; Pub. No. 3-EC-78-8/9

Action Plan; Beaufort Sea Action Plan; 1977; NORCOR; Working Document.

Lancaster Sound; Overview of Lancaster Sound spills; 1977; OAS; Published OAS.

Labrador Sea Scenario; Develop major oil spill scenario and countermeasures; 1977; C-CORE; Published OAS.

Lancaster Sound; Overview of Lancaster Sound spill scenario; 1978; Published OAS.

Atlas Update; Update the Arctic Atlas; 1978-79; Fenco; Working Document.

Table 2 -
Behaviour
and Fate:

(Project; Objectives; Time Frame; Contractor and Report Status).

Reference Oil; Appraise aging and artificial aging; 1977; Chemex; Unpublished.

Oil Under Ice; Assess behaviour of oil under first-year ice; 1977; Arctec; Pub. No. 4-EC-78-9.

Deepwater Blowout; Behaviour of deep water blowouts; 1977; OAS; Unfinished.

Prediction System; Develop spill model; 1977; AES; Under Review.

Photoxidization; Assess photox additives; 1977; Gesser; Unpublished.

Test Site; Assess poss. of having test site; 1978; Hovey; Unpublished.

Test Site; Look for test site location; 1978; Geoanalysis; Unpublished.

Behaviour and Fate; Assess variety of oil behaviours; 1978; Mackay; Under Review.

Photoxidation; Assess photox additives; 1978; Gesser; Unpublished.

Deepwater Blowout; Behaviour of deepwater blowouts; 1978; OAS; Unfinished.

Prediction System; Develop spill model; 1978; AES; Under Review.

Oil and Gas Under Ice; Photographic study of static behaviour; 1978; Mackay; Under Review.

Kurdistan Study; Study oil-in-ice behaviour; 1978; C-CORE; Under Review.

Deepwater Blowout; Study gas hydrate formation; 1979; OAS; Unfinished.

Kurdistan Spill; Oil-in-ice study of spill; 1979; C-CORE; Under Review.

Spill Behaviour; Study oil properties & behaviour; 1979; Mackay; Under Review.

Oil/Gas Under Ice; Effects of water current; 1979; Acres; Working document.

Table 3 -
In-Situ
Combustion:

(Project; Objectives; Time Frame; Contractor and Report Status).

Wicking Devices; Assess wicking devices for burning; 1977-78; Energetex; Unpublished

Incendiary Devices; Assess air-deployable incendiary devices; 1977; Energetex; Pub. No. 3-EC-79-3.

Smoke Plume; Assess characteristics of smoke plume; 1977; Mackay; In Publication.

Burning Equipment; Assess & test containment for in-situ burning; 1977; Bennett; Unpublished.

Burning Equipment; Assess-test containment for in-situ burning; 1977; Arctec; Unpublished.

Combustion Promoters; Evaluate combustion promoting agents; 1978; Arctec; Pub. No. 3-EC-79-8

Combustibility; Assess burning of aged oils on medium scale; 1978; Energetex; Under review.

Combustibility; Assess burning of aged oils in laboratory; 1978; Mackay; Under review.

Incendiary Devices; Develop incendiary devices; 1978; DREV; Unfinished.

Incendiary Devices; Develop incendiary devices; 1979; DREV; Unfinished.

Incendiary Devices; test incendiary devices; 1980; DREV; Unfinished.

Table 4 -
Disposal
and
Incineration:

Beaufort Sea Disposal; Locate disposal sites in Beaufort Sea; 1977; R.M. Hardy; Pub. No. 3-EC-79-3.

Air Portable Incin.; Develop helicopter - deployable incinerator; 1977; Trecon; no report-design.

Air Portable Incin.; Develop helicopter - deployable incinerator; 1978; Trecon; no report-eqt.

Incinerator Trials; Test helicopter - deployable incinerator; 1978; Energex; Unpublished.

Air Portable Incin.; Update design on incinerator; 1979; Trecon; no report-blueprint.

Table 5 - Field Biology; Assess dispersants in Labrador Sea; 1977;
Dispersants Trudel; Working document.
and oil
effects: Acute Lethal Toxicity; Assess toxicity to Arctic species;
 1977; LGL; In publication.

Energetic Effects; Assess dispersants and oil sublethal
effects; 1978-79; Slaney; Under review.

Acute Lethal toxicity; Assess toxicity to Arctic species;
 1978; LGL; In publication.

Oiled Birds; Oiled bird study; 1979; CWS; Under review.

Field Effectiveness; Prelim. studies to disp. field trial;
 1979; Esso; Under review.

Table 6 - Ancillary Equipment; Pumps & separators for Arctic use; 1977;
Recovery Wes. Can. Hydr.; Pub. No. 4-EC-79-2.
Equipment:

Arctic Skimmers; Assess Arctic skimming concepts; 1977; German
& Milen; Working Doc.

Arctic Skimmers; Assess Arctic skimming concepts; 1977;
Arctec; Working Doc.

Arctic Skimmers; Assess Arctic skimming concepts; 1977;
Bennett; Working Doc.

Arctic Skimmers; Assess Arctic skimming concepts; 1977;
Hoverlift; Working Doc.

Arctic Skimmers; Assess Arctic skimming concepts; 1977; Oil
Mop; Working Doc.

Portadam; Develop Portadam for rivers, streams; 1977;
Concenco; Unpublished.

Underwater; Evaluate containment concepts; 1978; Lockheed; In
publication.

Arctic Skimmer; Develop Morris skimming concept; 1978; Morris;
No report.

Arctic Skimmer; Develop Bennett skimming concept; 1979;
Bennett; No Report.

Air and Water Carriers; Evaluate containment systems; 1978;
Arctec; Unpublished.

Arctic Skimmer; Develop oil mop concept; 1978; Oil Mop; No
Report.

Separator Trials; Assess prototype separator; 1978-79; Canguard; Unpublished.

OSCAR Skimmer; Evaluate OSCAR skimmer; 1978; Wes. Can. Hydr.; In Publication.

AMOP Boom; Develop an Arctic boom; 1978-79; McAllister; Unpublished.

Arctic Skimmer; Complete versatile skimmer; 1979; Versatile; No report.

Arctic Skimmer; Complete oil mop skimmer; 1979; Oil Mop; No Report - eqt.

Arctic Skimmer; Build a prototype Morris skimmer; 1979; Morris; No report - eqt.

Boom Repair; Repair AMOP boom; 1979; McAllister; No Report - ser.

Boom and Skimmer Tests; St. John's offshore evaluation; 1979-80; Arctec; Under review.

Boom Transport; Trailer and transport for AMOP boom; 1979; McAllister; No report - eqt.

Boom Testing; Provide assistance at boom test; 1979; McAllister; Unpublished & ser.

Boom Kit; Spare parts for boom; 1979; Versatile; No report - eqt.

Scale Blowout; Design scale model; 1979; North-Tech; Unpublished.

Table 7 -
Remote
Sensing and
Tracking:

Ice-Movement Buoys; Recommend systems for tracking ice; 1977; Inn. Ventures; Pub. No. 3-EC-78-7

Remote Sensing; Develop Arctic package; 1977; CCRS; Under review.

Remote Sensing; Develop Arctic package; 1978; CCRS; Under review.

Detection of Oil Under Ice; Feasibility of detection of in ice; 1978; Nordco; Pub. No. 3-EC-79-11.

Kurdistan Spill; Remote sensing during spill; 1978; CCRS; In publication.

Satellite Sensing; Detection of Kurdistan oil; 1978-79;
Remotec; In publication.

Kurdistan Spill; Remote sensing and data analysis; 1979; CCRS;
In publication.

AMOP Report; Prepare report on remote sensing; 1979; CCRS;
Under review.

Ice Tracking Buoys; Develop ice tracking buoys; 1979; Orion;
Unpublished.

Detection of Oil Under Ice; Field trials in test tank; 1980;
Remotec; Unfinished.

Real-Time Display; Develop real time display; 1980; CCRS;
Unfinished.

Equipment Rental; Passive system for under-ice detection;
1980; Leasamatic; Unfinished.

Table 8 -
Shoreline
Surveys,
Protection
and
Cleanup:

Coastline Geomorphology; Coast types in Labrador; 1977; GSC;
Published; EMR.

Coastline Geomorphology; Coast types on Baffin; 1978; GSC;
In publication.

Shoreline Priorization; Priorize Beaufort Coast; 1978; AEGL;
No report.

Cleanup Techniques; Evaluate burning for shore cleanup; 1978;
Hardy; In publication.

In-Situ Combustion; Burning as cleanup techniques; 1979-80;
Energetex; Unfinished.

Table 9 -
Experimental
Oilspills:

Multi-Year Ice/Oil; Experimental spill in Griper Bay, N.W.T.;
1977-78; NORCOR; Working document.

Experimental Spill; Plan exp. spill program; 1978-79; Metge;
Published - int.

Spill Committee; Participate in spill planning; 1978; C-CORE;
No report - ser.

Spill Committee; Participate in spill planning; 1978; Aklavik;
No report - ser.

Shoreline Experiment; Plan experimental spill; 1978; Owens;
Work document.

Shoreline Experiment; Plan experimental spill; 1978; Nordco;
Work document.

Test Site Selection; Select site for near-shore exp.; 1979;
Owens; Work Document.

Multi-Year Ice/Oil; Experimental spill in Griper Bay; 1979;
Arctec; Under review.

Exper. Program; Support monies for planning; 1979; NA; No
Report - ser.

Exp. Site Selection; Select site for near-shore exp.; 1979;
GSC; No report - ser.

Exp. Site Selection; Select site for near-shore exp.; 1979;
NA; No report - ser.

BIOS Equipment; Purchase Items for BIOS; 1979; NA; No report -
eqt.

BIOS Sorbents; Purchase sorbent for BIOS; 1979; Sparrow; No
report - eqt.

BIOS Expenses; Expenditures for BIOS; 1979; NA; No report -
ser.

BIOS Project; Contribution toward BIOS; 1980; Various;
Unfinished.

Project: EAMES
Eastern Arctic Marine Environmental Studies.

Geographic Area: Two major geographic areas:
1. Baffin Bay - Lancaster Sound sector
2. Southern sector: Davis Strait from Cape Dyer to the northern tip of Labrador, along with Hudson Strait and Ungava Bay.

Objectives: Comprehensive scientific investigation of a marine Arctic ecosystem. The purpose of EAMES was to investigate the offshore and nearshore waters and the marine life of the study area.

Approach/Progress: Joint industry - government program including studies of: ice conditions; meteorology; oceanography; geomorphology; biological studies; and elements of socio-economic relevance.

Reports: Study Reports - Biophysical study reports prepared for the southern sector are available for purchase from:
Pallister Resource Management
3rd Floor, 700 - 6th Avenue S.W.
Calgary, Alberta T2P 0T8

Northern sector reports should be available July 1981 from above source.

Scientific Publications - Publications on the northern sector will be published as a special issue of Arctic, 1982.

Integrated Reports - A series of five summary reports for the northern EAMES sector is being prepared for early 1982 distribution (Dept. of Indian Affairs and Northern Development - Publications Inquiry Section, 14th Floor, Ottawa, Ontario, K1A 0H4).

Biophysical Study Atlas - Information on the biological and physical components of the northern EAMES section are to be summarized in an atlas (available 1982, Petro-Canada.)

Time Frame: 1976-1980.

Undertaken By: Joint government - industry program.

Reference: EAMES: The achievements of an environment program. 1981. Dept. of Indian Affairs and Northern Development. Catalogue No. R72-167/1981. Ottawa, Ontario. 37 pp.

Project: OFFSHORE WIND/WAVE CLIMATE STUDIES

Geographic Area: Offshore areas north of 60°N latitude.

Objectives: To improve knowledge of the climatology of offshore elements such as winds, waves, structural icing, etc., using derived data bases.

Approach Progress: Gridded surface pressure data is being used to derive offshore winds and waves. These are being used to determine representativeness for surface offshore conditions. Emphasis has been placed on the Lancaster Sound area to date.

Reports: Lachapelle A. (1980. Winds and waves in Lancaster Sound. Interim Report, Canadian Climate Centre, Atmospheric Environment Service, Downsview, Ont., 31 pp.

Time Frame: Project continuing over next 2-3 years.

Undertaken By: Arctic Meteorology Section
Atmospheric Environment Service
Environment Canada.

Research Personnel: A. Lachapelle, J.B. Maxwell

Funded by: Initial funding through the Baseline Studies Program from Western and Northern Region, DOE.

Contact: J.B. Maxwell Telephone: 416-667-4550
Arctic Meteorology Section
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario M3H 5T4

Project: CLIMATIC STUDY OF NORTHWESTERN BAFFIN BAY.

Geographic Area: Northwestern Baffin Bay, roughly 71° to 76°N latitude, 70° to 81°W longitude.

Objectives: To provide an analysis of the climatic and related factors that are relevant to offshore activities in northwestern Baffin Bay during the July-to-November period of the year.

Approach Progress: Study completed.

Reports: Maxwell, J.B., P.J. Duck, R.B. Thompson, and G.G. Vickers. (1980). The climate of Northwestern Baffin Bay. Unpubl. Report No. 80-2, Canadian Climate Centre, Downsview, Ont., 105 pp.

Undertaken By: Arctic Meteorology Section, Atmospheric Environment Service, Environment Canada

Research Personnel: J.B. Maxwell, P.J. Duck, R.B. Thompson, and G.G. Vickers.

Funded by: Petro-Canada Exploration Inc., Calgary, Alberta

Contact: J.B. Maxwell Telephone: 416-667-4550
Arctic Meteorology Section
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario M3H 5T4

Project: REGIONAL CLIMATE STUDY OF THE CANADIAN ARCTIC ISLANDS AND
ADJACENT WATERS.

Geographic Area: Canadian lands/waters north of the mainland.

Objectives: Preparation of a handbook drawing together all climatic
information for the study areas which would be pertinent to
developmental activities and for environmental concerns
there.

Approach Study completed.
Progress:

Reports: Maxwell, J.B. (1980). Climate of the Canadian Arctic Islands
and Adjacent Waters. Vol. 1. Climatological Studies No. 30,
Atmospheric Environment Service, Toronto, 531 pp. Vol. 2 in
press.

Time Frame: Publication of Volume 2 expected 1982.

Undertaken Arctic Meteorology Section
By: Atmospheric Environment Service
Environment Canada.

Research Personnel: J.B. Maxwell

Contact: J.B. Maxwell Telephone: 416-667-4550
Arctic Meteorology Section
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario M3H 5T4

Project: ARCTIC AIR TEMPERATURES RELEVANT TO STEEL SELECTION FOR SHIP HULLS.

Geographic Area: Offshore Areas north of 60°N latitude.

Objectives: To incorporate concept of air temperature into existing MOT-administered shipping control zones in the Arctic so as to reflect adequate steel selection for ship-hull design.

Approach
Progress: Air temperature extremes (low temperatures) at 1,3 and 10 percent levels were areally analyzed for the Arctic and changes in the existing shipping control zones were suggested as result. A preliminary draft report was prepared and final work is in progress.

Reports: In preparation.

Time Frame: Project complete July 1981.

Undertaken By: Arctic Meteorology Section, Atmospheric Environment Service, Environment Canada.

Research Personnel: J.B. Maxwell

Funded by: Transport Canada.

Contact: J.B. Maxwell Telephone: 416-667-4550
Arctic Meteorology Section
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario M3H 5T4

Project: CLIMATIC CHANGE IN THE ARCTIC

Geographic Area: North of 60°N latitude.

Objectives: To make a preliminary assessment on the magnitude and geographical extent of climatic change in the Arctic during the Holocene and as expected in the next half century.

Approach Progress: 1. An extensive literature survey is in progress to determine scope of previous work done on this subject. Coincident with this is a general analysis of historical weather data to detect trends.
2. An analog approach is being used to derive maps of expected arctic climate conditions under a CO₂ - induced atmospheric warming during the next half century.

Time Frame: 1. Report by early 1982.
2. Report late 1981.

Undertaken By: Arctic Meteorology Section, Atmospheric Environment Service,
Environment Canada

Research Personnel: J.B. Maxwell, R.C. Harvey.

Contact: J.B. Maxwell Telephone: 416-667-4550
Arctic Meteorology Section
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario M3H 5T4

Project: ENVIRONMENTAL ASPECTS OF ARCTIC MARINE TRANSPORTATION:
SEA STATE, ICE AND WEATHER.

Geographic Area: Beaufort Sea, North Coast of Alaska, Northwest Passage.

Objectives: To bring together all meteorological, ice and sea state information relative to arctic marine transportation of hydrocarbon.

Approach Progress: Report now (15 June 81) in final draft form.

Time Frame: Final report 15 August 81.

Undertaken By: Atmospheric Environmental Service, Western Region,
Environment Canada

Research Personnel: Neil Parker, John Alexander - Arctic
Weather Centre.

Funded by: Atmospheric Environment Service, Western Region.

Contact: B.M. Burns Telephone: 403-437-1250
Regional Director
Atmospheric Environment Service
Western Region
Argyll Centre
6325 - 103 Street
Edmonton, Alberta T6N 5H6

Project: ANNUAL REPORTS OF BEAUFORT WEATHER OFFICE (BWO).

Geographic Area: Beaufort Sea Area.

Objectives: To review forecast (weather, wave, ice) support to drilling operations in the Beaufort Sea.

Approach
Progress: Report prepared at end of each season.

Undertaken
By: Atmospheric Environment Service, Western Region,
Environment Canada

Research Personnel: Ed Hudson, Special Projects Office.

Funded
by: Atmospheric Environment Service (cost recovered).

Contact: B.M. Burns Telephone: 403-437-1250
Regional Director
Atmospheric Environmental Service
Western Region
Argyll Centre
6325 - 103 Street
Edmonton, Alberta T6H 5H6

Project: OPERATIONAL SYSTEMS DESIGN R & D.

Geographic Area: Southern Beaufort Sea.

Objectives: Systems design and development for operational weather, ice and sea state forecasting procedures.

Approach Work to allow prototype implementation of forecast procedures
Progress: in operational settings.

Reports: Refer to Meteorological Services Research Branch Quarterly Reports.

Time Frame: Continuing

Undertaken Systems Design Division
By: Meteorological Services Research Branch
Atmospheric Environment Service - Environment Canada.

Funded Pending, to be funded by Transport Canada.
by: Scientific Authority - A.L. Bealby.

Contact: A.L. Bealby Telephone: 416-667-4814
Systems Design Division
Meteorological Services Research Branch
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario M3H 5T4

Project: SATELLITE ICE STATUS SYSTEM R & D

Geographic Area: Southern Beaufort Sea

Objectives: Weather satellite data reception, management processing and interpretation for supporting the AES ice services.

Approach Progress: Development of an Ice Status System for interpretation of sea ice conditions from weather satellites, for input to ice prediction models.

Reports: Refer to Meteorological Services Research Branch Quarterly Reports.

Time Frame: Continuing.

Undertaken By: Aerospace Meteorology Division, Meteorological Services Research Branch, Atmospheric Environment Service, Environment Canada.

Funded by: Contracts funded by Transport Canada
Scientific Authority - E.G. Morrissey

Contact: E.G. Morrissey Telephone: 416-667-4812
Aerospace Meteorology Division
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario M3H 5T4

Project: MARINE OIL SPILL TRAJECTORIES R & D

Geographic Area: Canada's navigable waters, including southern Beaufort Sea.

Objectives: Development of real-time system applicable on any Canadian marine area.

Approach Progress: Development of geographically re-locatable, fast-response models to forecast over-water trajectories of oil slicks and continuous spills.

Reports: Refer to Canadian Geophysical Bulletin and Meteorological Services Research Branch Quaterly Reports.

Time Frame: To 1985

Undertaken By: Forecast Research Division
Meteorological Services Research Branch
Atmospheric Environment Service, Environment Canada.

Funded by: Contracts funded by Environment Canada, Transport Canada and the National Research Council.

Contact: E.C. Jarvis Telephone: 416-667-4811
Forecast Research Division
Meteorological Services Research Branch
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario M3H 5T4

Project: WAVE AND SWELL FORECASTING R & D

Geographic Area: Canada's navigable waters, including Arctic Regions.

Objectives: To automate the significant wave approach to ocean wave and swell forecasting and develop spectral wave models for operation in the AES Forecast System.

Approach
Progress: Use existing operational significant wave procedures as a base for developing automated procedures and adapt theory of spectral wave modelling for meeting Canadian needs.

Reports: Refer to Arctic Systems, Plenum Press, New York and London, 1977. 956 pp. Edited by P.J. Amaria, A.A. Bruneau, P.A. Lapp.

Time Frame: Continuing

Undertaken
By: Forecast Research Division, Meteorological Services Research Branch, Atmospheric Environment Service, Environment Canada.

Funded
by: Contracts funded by Environment Canada and Transport Canada. Scientific Authority - E.C. Jarvis

Contact: E.C. Jarvis Telephone: 416-667-4811
Forecast Research Division
Meteorological Services Research Branch
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario M3H 5T4

Project: SEA-ICE MODELLING R & D

Geographic Area: Ice-congested Canadian waters, including Southern Beaufort Sea.

Objectives: Development of regional sea-ice prediction models for real-time prediction of ice movement, concentration, growth, ablation, ridging and lead formation and scientific management of the Beaufort Sea Winter Ice Experiment for site-specific ice model development and data acquisition.

Approach
Progress: Development of fast response (i.e., a few hours from data time) prediction models operating over regional domains (about 1500 km to a side) with a spatial resolution of tens of kilometers and forecast period of several days. First versions are supporting operations at Ice Forecast Central.

Publications: Refer to Canadian Geophysical Bulletin and Meteorological Service Research Branch Quarterly Reports.

Time Frame: Continuing.

Undertaken By: Forecast Research Division, Meteorological Service Research Branch, Atmospheric Environment Service, Environment Canada.

Funded by: Contracts funded by Atmospheric Environment Service, Transport Canada, Dept. of Supply and Services and Dome Petroleum Ltd.
Scientific Authority - E.C. Jarvis

Contact: E.C. Jarvis Telephone: 416-667-4811
Forecast Research Division
Meteorological Service Research Branch
Atmospheric Environment Service
4905 Dufferin Street
Downsview, Ontario M3H 5T4

Project: LONG TERM FATE AND EFFECTS OF BALAENA BAY OIL SPILL

Objectives: This study is intended to examine the biological communities both on the shore and on the sea bed with the objective of identifying any quantifiable long term effects from the first large scale experimental oil spill in the Canadian Arctic conducted in 1974/75 as part of the Beaufort Sea Project.

Reports: Expected by October 1, 1981.

Time Frame: Commencement July 15, 1981

Undertaken D.F. Dickins, Seakem Oceanography, and J. Hellebust
By: (University of Toronto)

Funded Gulf Canada Resources, Calgary
by:

Contact: G. Gainer Telephone 403-233-4000
Gulf Canada Resources

Project: STUDY OF ICE CONDITIONS ALONG A YEAR ROUND SHIPPING ROUTE FROM THE BERING STRAIT TO THE CANADIAN BEAUFORT SEA, JUNE 1979.

Approach
Progress: Ice and climatic conditions along the route were evaluated using satellite imagery, ice charts and a comprehensive literature search. Such parameters as leads, ice pressure and multi-year ice encounter were summarized statistically.

Reports: Report submitted to Client

Time Frame: Completed.

Undertaken
By: D.F. Dickins
3732 West Broadway
Vancouver, B.C. V6R 2C1

Funded
by: Dome Petroleum Ltd.

Contact: G. Davis Telephone: 403-266-7749
Dome Petroleum Ltd.

Project: AIR DEPLOYABLE OIL SPILL IGNITER TESTS, YELLOWKNIFE, MAY 1979

Approach
Progress: A series of prototype igniters were dropped from a helicopter into an oiled melt water pool on the ice surface of a small lake, to test potential applications in the Beaufort Sea.

Reports: Report submitted to client.

Time Frame: Completed.

Undertaken
By: D.F. Dickins
3732 West Broadway
Vancouver, B.C. V6R 2C1

Contracted
by: Canadian Marine Drilling Ltd.

Contact: W. Pistruzak
Dome Petroleum Ltd. Telephone: 403-266-7213

Project: OIL AND GAS UNDER SEA ICE, DECEMBER 1980

Approach
Progress: Three discharges of oil and gas were conducted under the ice at McKinley Bay during the winter of 1979/80. Detailed measurements were made as to oil distribution under, within and finally on the surface of the ice in the spring. Environmental impact was monitored and over 80% of the total oil spilled, removed by in situ burning, evaporation and manual clean-up.

Reports: Draft complete - out for review.

Time Frame: Final Report and Appendix (Vol. 2) expected by July 1981.

Undertaken
By: D.F. Dickins
3732 West Broadway
Vancouver, B.C. V6R 2C1

Funded
by: Dome Petroleum Ltd.
Scientific Coordinator - D.F. Dickins with Ian Buist of Dome as Joint Author.

Contact: Ian Buist Telephone: 403-266-7712
Dome Petroleum Ltd.

Project: ICE CONDITIONS ALONG ARCTIC TANKER ROUTES (TO BE INCLUDED IN VOLUME 3 OF DOME'S BEAUFORT SEA PRODUCTION, E.I.S.)

Objectives: The summary document describes the important characteristics of the different ice regimes along eastern and western tanker routes originating in the Canadian Beaufort Sea.

Reports: Summary Report (39 pp) completed. Source Document being assembled.

Undertaken D.F. Dickins
By: 3732 West Broadway
Vancouver, B.C. V6R 2C1

Funded Dome Petroleum Ltd.
by:

Contact: R. Pilkington Telephone: 403-266-7746
Dome Petroleum Ltd.

Project: SEA ICE MOTION IN THE SOUTHEASTERN BEAUFORT SEA, 1978.

Geographic Area: SouthEast of line joining Prince Patrick Island to Pt. Barrow

Objectives:

- Observe drift of ice within the shear zone of the southeastern Beaufort Sea ice pack
- Determine sources of ice found in the drilling areas during summer.
- Determine the rates of deformation, and modes of deformation of the pack ice within the study area.
- Investigate the relationships between ice movement and wind & current forces.
- Determine statistical properties of the temporal and spatial variations in ice movement.

Approach
Progress:

- Observe the movement of satellite-tracked drift buoys deployed on the sea ice.
- Study the relationship between observed ice motions, and large-scale sea ice morphology evident from weather satellite imagery.

Reports: Anticipated in 1981.

Time Frame: Motion observed by drifters between 15 January and 12 October 1978.

Undertaken
By: Arctic Marine Science Group
Institute of Ocean Sciences
Fisheries and Oceans Canada

Research Personnel: Humfrey Melling.

Contact: Humfrey Melling Telephone: 604-656-8252
Institute of Ocean Sciences
Sidney, B.C. V8L 4B2

Project: BEAUFORT SEA WINTER ICE EXPERIMENT, 1979: OCEANOGRAPHY.

Geographic Area: South of 73°N; East of 140°W, excluding Amundsen Gulf.

Objectives:

- Identify features of the baroclinic flow field over the area from the surface to a depth of 400 m (speeds & directions of current).
- Obtain a detailed description of water masses in the area (temperature and salinity) during early winter, when no observations exist.

Approach Progress: Acquisition of CTP profiles over the study area using aircraft.

Reports: Anticipated September 1981.

Time Frame: CTP profiles during last week of November 1979.

Undertaken By: Frozen Sea Research Group
Institute of Ocean Sciences
Fisheries and Oceans Canada

Research Personnel: H. Melling.

Contact: H. Melling Telephone: 604-656-8252
Institute of Ocean Sciences
Sidney, B.C. V8L 4B2

Project: BEAUFORT SEA WINTER ICE EXPERIMENT, 1981: OCEANOGRAPHY

Geographic Area: Southeast of line joining C. Halkett (Alaska) to C. Prince Alfred (Banks Island), excluding Amundsen Gulf.

Objectives: Identify features of the baroclinic flow field over the area from the surface to a depth of 1000 m (speeds and directions of current).
Obtain a detailed description of water masses in the area (temperature and salinity)
Elucidate processes resulting in an exchange of water between the continental shelves, and the ocean basin (upwelling, density currents).
Investigate properties of the eastward flowing current observed in summer at the edge of the Alaskan shelf, and possibly extending eastward to the Tuk Shelf.

Approach
Progress: Wide-ranging acquisition of CTP profiles over the study using aircraft.
Installation of 7 current meter moorings
- 4 moorings on a line traversing the shelf break north of Prudhoe Bay
- 3 moorings along the edge of the shelf northeast of Tuktoyaktuk.

Reports: Not anticipated before 1982.

Time Frame: CTP profiles from mid-March to mid-April 1981.
Current measurements from early April to August 1981.
Data analysis from September 1981 - September 1982.

Undertaken
By: Frozen Sea Research Group
Institute of Ocean Sciences
Fisheries and Oceans Canada

Research Personnel: H. Melling

United States Coast Guard
Research and Development Center, Groton, CT.

Research Personnel: P. Greisman

Contact: H. Melling Telephone: 604-656-8252
Institute of Ocean Sciences
Sidney, B.C. V8L 4B2

Project: ARCTIC MARINE OILSPILL PROGRAM

Geographic Area: Beaufort Sea Coast

Objectives: To identify potential sites for debris disposal and storage related to oilspills.

Approach Progress: Developed guidelines for selection, design, construction and reclamation of sites. Identified potential locations by air photo interpretation.

Reports: Oiled Debris Disposal and Storage Sites: Beaufort Sea Coast
Economic and Technical Review Report EPS 3-EC-79-3

Time Frame: Completed in November 1979

Undertaken By: R.M. Hardy and Associates Ltd.
Calgary, Alberta

Funded by: Environment Canada
Research and Development Division
Environmental Emergency Branch
Environmental Impact Control Directorate
Environmental Protection Service

Scientific Authority:
EPS Yukon Office (Mr. Wishart Robson)
(no longer with Environment Canada).

Contact: Mr. C.D. Wykes Telephone: 403-667-6487
Director
Environmental Protection Service
Room 225, Federal Building
Whitehorse, Yukon Y1A 2B5

Project: EXPANDED POWER SUPPLY ALTERNATIVES FOR INUVIK - TUKTOYAKTUK AREA.

Geographic Area: Between Inuvik and Tuktoyaktuk, NWT.

Objectives: To examine various alternatives to adequately service the rapidly expanding power requirements in the Inuvik - Tuktoyaktuk area as a consequence of hydrocarbon exploration activity in the area. (e.g., Dome Petroleum Ltd., Arctic Transportation Ltd.).

Approach Progress: Economic analysis to be carried out by outside consulting firm of various alternatives, including

- (a) The establishment of a new diesel generating station at Tuktoyaktuk which would augment the existing standby diesel plant;
- (b) The construction of a new transmission line between Inuvik and Tuktoyaktuk, with generation to continue from an expanded Inuvik diesel plant; and
- (c) The installation of a gas-turbine plant at the Parsons Lake field between Inuvik and Tuktoyaktuk to tie in to an expanded transmission line facility.

Reports: Request for proposal covering the economic analysis issued in late May, 1981. A report would be expected by August, 1981.

Time Frame: Construction of an expanded supply facility to be completed by Spring of 1983.

Undertaken By: Economic analysis undertaken by Consulting agency.

Funded by: Northern Canada Power Commission.

Contact: B.G. Christie Telephone: 403-465-3377
Northern Canada Power Commission
7909 - 51 Ave.
P.O. Box 5700, Stn. "L"
Edmonton, Alberta
T6C 4J8

Project: PHYSICAL OCEANOGRAPHY IN THE NORTHWEST PASSAGE

Geographic Area: Northwest Passage

Objectives: To determine and understand oceanographic processes within the Northwest Passage with emphasis on the ice covered period;
- currents, causes and temporal and spatial variability
- water levels, causes and variability
- water structure, distribution of temperature, density, salinity, and various nutrients.
Variability of these properties.

Approach - Obtain data by conducting a variety of measurements
Progress: including deployment of instruments which record data for up to one year
- Numerical modelling.

Reports: Planning working paper, March 1981
Reports anticipated starting Fall 1982.

Time Frame: Field work to commence during March 1982.
- Western Northwest Passage (Prince of Wales Strait, M'Clure Strait, Viscount Melville Sound) in 1982;
- Mid-Northwest Passage (Viscount Melville Sound, Barrow Strait and adjacent channels) tentatively 1983;
- Eastern Northwest Passage (Barrow Strait, Prince Regent Inlet, Wellington Channel) tentatively 1984.

Undertaken Institute of Ocean Sciences, Fisheries & Oceans Canada
By: Physical Oceanography: Frozen Sea Research Group
Robert A. Lake
Numerical Modelling: Falconer Henry

Funded This project is a portion of a co-ordinated research effort
by: by the Federal Government and Industrial Agencies.

Contact: Physical Oceanography
Robert A. Lake Telephone: 604-656-8280
Numerical Modelling
Falconer Henry Telephone: 604-656-8249
Institute of Ocean Sciences
Sidney, B.C. V8L 4B2

Project: FISH, INVERTEBRATES AND MARINE PLANTS OF THE SOUTHERN BEAUFORT SEA - AN OVERVIEW.

Geographic Area: Beaufort Sea and Mackenzie River Delta

Objectives: To summarize in a format appropriate to the general public scientific information on the marine, anadromous and freshwater fishes of the Outer Mackenzie Delta/Beaufort Sea. The review will also examine available information on important invertebrate and plant species.

Approach
Progress: The report has gone through several drafts and hopefully will be available for publication in the fall of 1981.

Reports: To be published in the Beaufort Sea Project overview series.

Time Frame: Fall of 1981

Undertaken
By: Ocean Sciences and Surveys, Fisheries and Oceans Canada
Personnel: R. Percy of the Environmental Protection Service, Atlantic Region, Environment Canada, is authoring the report in association with B. Smiley and T. Mullin of the Ocean Information Division, Fisheries and Oceans.

Funded
by: Ocean Information Division, Fisheries and Oceans Canada.

Contact: R. Percy Telephone: 902-426-8301
Marine Assessments Division
Environmental Protection Service
Dartmouth, N.S.

B. Smiley Telephone: 604-656-8335
Ocean Information Division
Institute of Ocean Sciences
Sidney, B.C. V8L 4B2

Project: MICROBIOLOGY OF WATER AND SEDIMENTS AT ISSUNGUAK ARTIFICIAL ISLAND.

Geographic Area: Offshore Tuktoyaktuk peninsula.

Objectives:

1. Occupation of three stations around Issungnak with three depths and sediments sampled at each station. Sampling would be simultaneous with the oceanographic program of Arctic Labs.
2. Characterization of seasonal and spatial distribution of heterotrophic and oleoclastic bacteria in water columns and sediments.
3. Determination of seasonal and spatial variations of bacterial heterotrophic activity including measurements of turnover of ^{14}C -glutamic acid and the maximal velocity of this activity.
4. Measurement of degradation and mineralization of ^{14}C -labelled petroleum in water columns and sediments.
5. Measurements of concentrations of dissolved and particulate organic carbon in all water collections.
6. Integration and analysis of microbiological data with observations made by the oceanographic program - in particular, temperature and salinity, concentration of reactive nitrate and phosphate, chlorophyll a, phytoplankton numbers and concentrations of hydrocarbons at occupied stations.

Approach
Progress: Objectives 1 and 2 were realized in February and May 1981 through collections by Arctic Labs. Three full-scale field trips by staff of the Arctic Biological Station are planned for July, September and December 1981.

Reports: Techniques employed are described in:
Bunch, J.N. 1979. Microbiological observations in south Davis Strait. Env. Can. Fish. Mar. Serv. MS Rep. 1515, 92 p.

Bunch, J.N., R.C. Harland and J. Laliberté. 1981. Abundance and activity of heterotrophic marine bacteria in selected bays at Cape Hatt, N.W.T. 1980. Can. MS Rep. Fish. Aquat. Sci. 1611, 67 p.

Time Frame: One year.

Undertaken Arctic Biological Station, Fisheries and Oceans Canada.

By: Research Personnel: Dr. J.N. Bunch and R.C. Harland.

Funded
by:

Esso Resources Canada Ltd.
Scientific Authority - Mark Psutka.

Contact:

Dr. J.N. Bunch or R.C. Harland Telephone: 514-457-3660
Arctic Biological Station
Department of Fisheries and Oceans
555 St. Pierre Boulevard
Ste. Anne de Bellevue, Que. H9X 3R4

Project: WAVE CLIMATE STUDY

Geographic Area: Canadian Area of Interest from 35 degrees to 90 degrees north latitude on East Coast and from 40 degrees to 90 degrees north latitude on the West Coast, and from 40 degrees to 180 degrees west longitude.

Objectives: To install equipment and measure waves in support of marine design and construction, offshore hydrocarbon exploration, and oceanographic experiments.

Approach Progress: Eleven active locations as of June 9, 1981, with 25 to 30 active locations expected during summer and fall seasons and more specifically, 4 waverider stations in the Beaufort Sea.

Reports: Standard data booklet
Special analyses available on request.

Time Frame: Ongoing study but July and August observations expected for the Beaufort Sea.

Undertaken By: Marine Environmental Data Services, Environment Canada
(in conjunction with Dome Petroleum for the Beaufort Sea observations).

Research Personnel: Dr. R. Wilson, Director
Marine Environmental Data Services
Branch

Funded by: Dome Petroleum Ltd.
Scientific Authority - J.W. Steen

Contact: J. Gagnon Telephone: 613-995-2014
Marine Environmental Data Services Branch
240 Sparks Street, 7th Floor West
Ottawa, Ontario
K1A 0E6

Project: TERRAIN, LAND USE AND WASTE DRILLING FLUID DISPOSAL PROBLEMS ADJACENT TO EXPLORATORY WELLSITES IN PERMAFROST, ARCTIC CANADA.

Geographic Area: Arctic islands; Mackenzie Delta; Interior Yukon.

Objectives: Document the nature of terrain disturbances adjacent to exploratory wellsites.

To provide advice as to how these disturbances may be minimised.

To assess the effectiveness of present territorial Arctic Land Use Regulations, specifically with regard to the disposal of waste drilling fluids.

Approach Field and site investigations. Air photo interpretation.
Progress: Training of DIAND Land Use Inspectors (under contract).

Reports: 1978. H.M. French. Sump Studies I: Terrain disturbances. Environmental Studies 6, DIAND, Ottawa, 52 p.
1978. H.M. French. Why Arctic oil is harder to get than Alaska's. Canadian Geographical Journal, 93 46-51.
1978. H.M. French. Terrain and environmental effects of Canadian Arctic oil and gas exploration. Musk-Ox, 21, 11-17.
1979. H.M. French. Oil and gas exploration in the High Arctic islands: problems and prospects. Marburger Geographischen Schriften, 79, 13-26.
1979. H.M. French. Permafrost and ground ice. In: Man and Environmental Processes, (K.J. Gregory and D.E. Walling, eds.), Dawson Westview Press, Colorado, Chapter Nine (pp 144-162).
1980. H.M. French and M.W. Smith. Sump Studies II: Geothermal disturbances in permafrost terrain adjacent to Arctic oil and gas wellsites. Environmental Studies I4, DIAND, 61 p.
1980. H.M. French and M.W. Smith. Geothermal disturbances resulting from sump construction and use in permafrost terrain, Arctic Canada. Proceedings, Symposium on environmental fate and effects of drilling fluids and cuttings, Lake Bueno Vista, January 21-24, 1980, 139-164.
1980. H.M. French. Terrain, land use and waste drilling disposal problems, Arctic Canada, Arctic, 33, 794-806.

Time Frame: Ongoing

Undertaken By: H.M. French. Professor, University of Ottawa.

Funded
by:

Arctic Land Use Research Program, DIAND, Ottawa
Arctic Petroleum Operator's Association, Calgary.

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Telephone: 613-231-2471/6829

French Arctic Consultants Limited Telephone: 613-820-1196

- Project: THE STUDY OF COASTAL PROCESSES AND DYNAMICS, SOUTHWEST BANKS ISLAND, WESTERN CANADIAN ARCTIC.
- Geographic Area: Cape Kellett, Sachs Harbour, Sachs River Lowlands as far east as Masik River.
- Objectives: Determination of the nature and rapidity of coastal processes in an area of ice-rich permafrost sediments of Tertiary and Quaternary age.
- Approach Progress: Begun in 1978. Measurement of coastal change by field survey and air photographs. Investigation of ground ice and permafrost conditions in the area. Use of Woodhead seabed drifters to monitor nature of sediment movement. Use of standard climatic data and satellite imagery to document sea ice conditions, wave generation, and occurrence of high magnitude, low frequency events. Field Observations on effects of pack ice upon coastal system.
- Reports: Submitted: (1) M.J. Clark, H.M. French and D.G. Harry. Coastal processes and landforms, Sachs Harbour, southwest Banks Island. Canadian Journal of Earth Sciences.
(2) H.M. French, D.G. Harry and M.J. Clark. Ground ice stratigraphy and late Quaternary events, southwest Banks Island, Western Arctic. Proceedings, Fourth Canadian Conference on Permafrost.
- Time Frame: Completion by 1984.
- Undertaken By: Dr. H.M. French, Professor, University of Ottawa.
D.G. Harry, Ph.D. student, Department of Geography, University of Ottawa.
Dr. M.J. Clark, Professor, University of Southampton, U.K.
- Funded by: Natural Sciences and Engineering Research Council, grant A-8367 (H.M. French)
Polar Continental Shelf Project, Energy, Mines and Resources, project 73-34 (H.M. French).
- Contact: H.M. French Telephone: 613-231-2471/6829
University of Ottawa
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Ottawa, Ontario
K1N 6N5
- French Arctic Consultants Ltd. Telephone: 613-820-1196

Project: RESPONSES OF PEARY CARIBOU AND MUSKOXEN TO HELICOPTER HARASSMENT.

Geographic Area: Prince of Wales Island - applicable to entire High Arctic.

Objectives: To obtain information on the overt behavioural responses of Peary caribou and muskoxen to helicopter flights, including the simulation of cargo slinging.

Approach Progress: In Summer 1976 and 1977 we made controlled helicopter flights over Peary caribou and muskoxen and recorded their reactions, using both ground and aerial observers.

Reports: Selected Publications:
Canadian Wildlifer Service unpublished reports:
Miller, F.L. and A. Gunn. 1977. A preliminary study of some observable responses by Peary caribou (*Rangifer tarandus pearyi*) and Muskoxen (*Ovibos moschatus*) to turbo-helicopter harassment, Prince of Wales Island, Northwest Territories, July-August 1976. Part I Muskoxen. Unpubl. report prepared for Arctic Islands Pipeline Program by Can. Wildl. Serv., Edmonton, Alberta. 53 pp.

Miller, F.L. and A. Gunn. 1977. A preliminary study of some observable responses by Peary caribou (*Rangifer tarandus pearyi*) and muskoxen (*Ovidos moschatus*) to turbo-helicopter harassment, Prince of Wales Island, Northwest Territories, July-August 1976. Part II Peary caribou. Unpubl. report prepared for Arctic Islands Pipeline Program by Can. Wildl. Serv., Edmonton, Alberta. 30 pp.

Miller, F.L. and A. Gunn. 1978. Responses of Peary caribou and muskoxen to helicopter harassment, Prince of Wales Island, Northwest Territories, 1976-77. Can. Wildl. Serv. Rep. CWSC 2675, 2 vols., 588 pp.

Publications:
Miller, F.L. and A. Gunn. 1977. A preliminary study of some observable responses by muskoxen (*Ovibos moschatus*) to turbo-helicopter induced harassment, Prince of Wales Island, Northwest Territories, July-August 1976. Canadian Wildlife Service Progress Note No. 78, 17 pp.

_____. 1977. A preliminary study of some observable responses by Peary caribou to helicopter induced harassment, Prince of Wales Island, Northwest Territories, July-August 1976. Canadian Wildlife Service Progress Note No. 79, 23 pp.

_____. 1977. A preliminary study of some observation responses by Peary caribou (*Rangifer tarandus pearyi*) and muskoxen (*Ovibos moschatus*) to turbo-helicopter induced harassment, Prince of Wales Island, Northwest Territories, July-August 1976. Arctic Islands Pipeline Program, Preliminary Report, 139 pp.

_____. 1978. Caribou and muskoxen response to helicopter harassment, Prince of Wales Island, 1976-77. Environmental-Social Program, Northern Pipeline, ESCOM No. A1-30. 176 pp.

Miller, F.L. and A. Gunn. 1979. Responses of Peary caribou and muskoxen to helicopter harassment. Canadian Wildlife Service, Occasional Paper No. 40. 90 pp.

Gunn, A. and F.L. Miller. 1980. Responses of Peary caribou cow-calf pairs to helicopter harassment in the Canadian High Arctic. Second International Reindeer and Caribou Symposium, 17-21 Sept., Roros, Norway.

Time Frame: Summer 1976 and 1977

Undertaken Canadian Wildlife Service
By: Western & Northern Region, Environment Canada

Research Personnel: F.L. Miller and A. Gunn
(Dr. Anne Gunn is now with the NWT Wildlife Service)

Funded Arctic Island Pipeline Project, Polar Continental Shelf
by: Project and CWS.

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Project: INTER-ISLAND MOVEMENTS OF PEARY CARIBOU

Geographic Area: Western Queen Elizabeth Islands and the Prince of Wales Island-Somerset Island-Boothia Peninsula complex.

Objectives: To document the springtime annual movements of Peary caribou between two or more islands in the Canadian High Arctic.

Approach Progress: Dye marked Peary caribou on Prince Patrick and Eglinton islands in spring 1974 and relocated them during June and July 1974.

Flew aerial surveys over the sea ice of Peel Sound, Viscount Melville Sound and Barrow Strait in 1977-80 to obtain evidence of inter-island movements of Peary caribou.

Reports: Selected Publications

Miller, F.L., R.H. Russell, and D.R. Urquhart. 1973. Preliminary surveys of Peary caribou and muskoxen on Melville, Eglinton, and Byam Martin islands, Northwest Territories, 1972. Can. Wildl. Serv. Rep. CWSC 1422, 51 pp.

Miller, F.L. and R.H. Russell. 1976. Distributions, movements and numbers of Peary caribou and muskoxen on western Queen Elizabeth Islands, Northwest Territories, 1972-74. Can. Wild. Serv. Rep. CWSC 2045, 493 pp.

Miller, F.L. and A. Gunn. 1979. Inter-island movements of Peary caribou south of viscount Melville Sound and Barrow Strait, Northwest Territories, May-July 1978. Can. Wildl. Serv. Rep. CWSC 2760, 74 pp.

Publications:

Miller, F.L. and R.H. Russel. 1974. Aerial surveys of Peary caribou and muskoxen on western Queen Elizabeth Islands, Northwest Territories, 1973. Canadian Wildlife Service, Progress Notes, No. 40, 18 pp.

Miller, F.L. and R.H. Russell. 1974. Distribution and numbers of muskoxen (*Ovibos Moschatus*) on western Queen Elizabeth Islands of Arctic Canada. Journal Mammalogy 55(4) 824-828.

Miller F.L. and R.H. Russell. 1975. Aerial surveys of Peary caribou and muskoxen on Bathurst Island, Northwest Territories, 1973 and 1974. Canadian Wildlife Service, Progress Notes, No. 44, 8 pp.

Miller, F.L. and R.H. Russel and A. Gunn. 1975. The recent decline of Peary caribou on western Queen Elizabeth Islands of Arctic Canada. Folarforschung 45(1) 17-21.

Miller, F.L., R.H. Russell, and A. Gunn. 1977. Distributions, movements and numbers of Peary caribou and muskoxen on western Queen Elizabeth Islands, Northwest Territories, 1972-74. Canadian Wildlife Service Report Series No. 40, 55 pp.

Miller, F.L. 1979. Inter-island movements of Peary caribou (*Rangifer tarandus pearyi*) on western Queen Elizabeth Islands, Arctic Canada. Canadian Journal Zoology 55(6) 1029-1037.

Miller, F.L., and A. Gunn. 1978. Inter-island movements of Peary caribou south of Viscount Melville Sound, Northwest Territories. Canadian Field-Naturalist. 91(4) 327-333.

Miller, F.L. and A. Gunn. 1980. Inter-island movements of Peary caribou south of Viscount Melville Sound and Barrow Strait, Northwest Territories, Canada. Second International Reindeer and Caribou Symposium, 17-21 Sept., Roros, Norway.

Miller, F.L., and A. Gunn. 1979. Inter-island movements of Peary caribou south of Viscount Melville Sound and Barrow Strait, Northwest Territories, May-July 1978. Canadian Wildlife Service Unpb Rep CWSC 2760, 74 pp.

Miller, F.L. and H. Kiliaan. 1980. Inter-island movements of Peary caribou in the Prince of Wales Island-Somerset Island-Boothia Peninsula complex, Northwest Territories, May-July 1979. Canadian Wildlife Service Prog. Note No. 107. 7 pp.

Miller, F.L. and H.P.L. Kiliaan. 1981. Inter-island movements of Peary caribou in the Prince of Wales Island-Somerset Island-Boothia Peninsula complex, Northwest Territories, June 1980. Canadian Wildlife Service Prog. Note No. 120. 7 pp.

Time Frame: 1974-1980

Undertaken Canadian Wildlife Service
By: Western and Northern Region, Environment Canada.

Research Personnel: F.L. Miller, A. Gunn and R.H. Russell
(Dr. Anne Gunn is now with NWT Wildlife Service)

Funded Polar Continental Shelf Project, Energy Mines & Resources
by: Arctic Island Pipeline Project (1976-77) and Canadian Wildlife Service, W&NR.

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Canadian Wildlife Service
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Project: LAKE REGIMES, MACKENZIE DELTA, NWT

Geographic Area: Mackenzie Delta

Objectives: Determine the water level regimes of a variety of lakes in the Mackenzie Delta under current Mackenzie River flow conditions, in order to assess the impact of increased flow regulation upon Delta lakes.

Approach
Progress: Record lake and channel water levels by means of time-lapse photography of staff gauges. Pilot study began in 1980, at one area. Expect to instrument other areas in 1981.

Reports: None as yet

Time Frame: Commenced 1980 - Terminate 1984.

Undertaken
By: Northern Hydrology Section, Surface Water Division,
Northern Hydrology Research Institute, Environment Canada

Research Personnel: J.C. Anderson, S. Bigras and
A.C.O. Terroux

Funded
by: Environment Canada

Contact: J.C. Anderson Telephone: 819-997-2385
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Surface Water Division
National Hydrology Research Institute
Ottawa, Ontario K1A 0G7

Project: ICE REGIME OF LOWER MACKENZIE RIVER AND MACKENZIE DELTA

Geographic Area: Mackenzie River below Ft. Norman; Mackenzie Delta

Objectives: To obtain information on processes and timing of freeze-up and break-up in the Mackenzie Delta channels and Mackenzie River below Fort Norman.

Approach
Progress: Field work in April (measurement of ice thickness), May and June (aerial photography, to record pattern and timing of break-up and location of jams). Water temperature recordings; to monitor amount and determine sources of heat available for melting and freezing.

Reports: In preparation, for Mackenzie River Basin Committee.

Time Frame: 1981-82 is the second year of this study. The planned length of this study is 5 years.

Undertaken
By: Northern Hydrology Section, Surface Water Division
Northern Hydrology Research Institute, Environment Canada

Research Personnel: A.C.D. Terroux

Funded
by: Environment Canada

Contact: A.C.D. Terroux Telephone: 819-997-2385
Northern Hydrology Section
Surface Water Division
National Hydrology Research Institute
Ottawa, Ontario K1A 0E7

Project: NORTHERN HIGHWAYS HYDROLOGY STUDY, MACKENZIE DELTA REGION, N.W.T.

Geographic Area: Mackenzie Delta Region, Inuvik-Tuktoyaktuk corridor.

Objectives: Provide hydrologic information relevant to the design and construction of the proposed Inuvik-Tuktoyaktuk Highway especially with regard to the sizing of culverts. This is to be accomplished through the collection and analysis of data on snowpack water equivalent, rainfall, discharge and icings at a number of drainage basins to be crossed by the highway.

In so doing, obtain an understanding of processes such as runoff response of different basin types to snowmelt and rainfall. Determine water balance component magnitudes and variations in the tundra and taiga environments of the region.

Approach
Progress: Field Work May-Sept.: collect data on snowpack water equivalent, precipitation, air temperature, discharge and note occurrence of icings at a minimum of four drainage basins along the route of proposed Inuvik-Tuk Highway. (Co-operate with Water Survey of Canada).

Office study, Oct.-Apr.: compilation and analysis of field data; preparation of a progress report for DIAND.

Reports: Anderson, J.C. (1980). "Hydrologic studies in the Mackenzie Delta region, N.W.T., 1979". Internal report to Northern Roads Environmental Working Group, DIAND, Ottawa. 39 p. & appendix.

Anderson, J.C. and A.W. Gell (1980). "Hans Creek icing study: 1979". Internal report to Northern Roads Environmental Working Group, DIAND, Ottawa, 12 p.

Time Frame: No specific termination date at present; commenced 1975.

Undertaken
By: Northern Hydrology Section, Surface Water Division
Northern Hydrology Research Institute, Environment Canada
Research Personnel: J.C. Anderson, S. Bigras, A.C.D. Terroux

Funded by: DIAND and Environment Canada

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- Project: STUDIES OF THE BEHAVIOUR AND EFFECTS OF OIL SPILLS IN ARCTIC LANDS AND WATERS AND SPILL COUNTERMEASURES, ESPECIALLY CHEMICAL DISPERSION.
- Geographic area: Laboratory work in Toronto, field work in Mackenzie Valley (Norman Wells, Inuvik, Tuktoyaktuk).
- Objectives: To understand better the behaviour of oil spills and thus better identify any adverse effects and develop more effective clean-up or restoration procedures.
- Approach Progress: This project has been underway since 1971 and has resulted in a number of reports. Several aspects are currently under study, especially
- i) chemical dispersion of oil spill
 - ii) oil spill behaviour at sea (evaporation, spreading, emulsion formation, adhesion to shorelines, mathematical modelling, general impact assessment, etc.
 - iii) oil spill behaviour on arctic shorelines
 - iv) oil spill behaviour on arctic soils
 - v) toxicity of oil to marine organisms
- Reports: Selected recent publications (from 1976).
- Mackay, D., 1977. "Oil from the Beaufort Sea: A personal viewpoint". The Beaufort Seer, February 1977.
- Mackay, D., "Commentary on offshore drilling in the Beaufort Sea" presented at the conference (November 1975) and published in the Proceedings "Mackenzie Delta: Priorities and Alternatives: Canadian Arctic Resources Committee, Ottawa
- Mackay, D., "Pipeline Yes: Today's Delay only means Tomorrow's Crisis", Macleans, p. 22, May 30, 1977.
- Brodsky, L., Charles, M.E., Greene, G.D., Mackay, D., "The use of deflectors for the deployment of oil booms at an angle to river currents". Report prepared for and published by the Petroleum Association for the Conservation of the Canadian Environment, 1977.
- Mackay, D., "Oil in the Arctic: Some personal views on inputs, countermeasures, effects and sanctuaries", Spill Technology Newsletter, 2 (2), March-April 1977.
- Gainer, J.G., Logan, W.J. and Mackay, D., (Editors) Proceedings of the Sixth Arctic Environmental Workshop, Fairmont, B.C., April 1977. Published as report EE6 of the Institute for Environmental Studies, University of Toronto.

Mackay, D., Nadeau, S., and Ng., C., "A small scale laboratory dispersant effectiveness test" presented at the ASTM Meeting, October 1977 and published in the Proceedings, ASTP 659, 1979, Philadelphia, Pa.

Mackay, D., "Why clean up oil spills?", Spill Technology Newsletter 3, No. 4, p. 11, July-August 1978 and Ecolibrium 8, No. 1, p. 1, 1979. (Shell Oil Co., Houston, Texas).

Mackay, D., "Fate and behaviour of oil spills", Chap. 2, Environmental Protection Service, Environmental Emergencies Branch Review of Oil Spill Literature, 1978.

Jones, S., and D. Mackay, (Editors). Proceedings of the Seventh Arctic Environmental Workshop, Fairmont, B.C., April 1978. Published as Publication EE8 of Institute for Environmental Studies, University of Toronto.

Mackay, D., and S. Paterson, (Editors), "Oil spill modelling", Proceedings of a Workshop held in Toronto, Canada, Nov. 1978, sponsored by Petroleum Association for Conservation of the Canadian Environment, Arctic Petroleum Operators Association, Department of Indian and Northern Affairs, East Coast Petroleum Operators Association, Environment Canada, Institute for Environmental Studies. Pub No. EE-12, Institute for Environmental Studies, University of Toronto.

Kisil, C.A., and D. Mackay, "A laboratory study of the Behaviour of oil and gas under ice", prepared for Fisheries and Environment Canada, 1979.

Mackay, D., "Three dimensional diffusion of dissolved and dispersed oil in the water column under oil slicks". Prepared for Fisheries and Environment Canada, 1979.

Day, T., Mackay, D., Nadeau, S. and R. Thurier, "Emissions from In Situ burning of crude oil in the Arctic", Water, Air and Soil Pollution 11, p. 139, 1979.

Bobra, A., Mackay, D. and W.Y. Shiu, 1979. "Distribution of hydrocarbons among oil, water and vapor phases during oil dispersant toxicity tests", Bull, Environm. Contam. Toxicol. 23, p. 558.

Mackay, D. and S. Paterson, (Editors), 1979. "Oil, ice and gas", Proceedings of a Workshop held in Toronto, Canada, October, 1979. Sponsored by Arctic Petroleum Operators Association, Environment Canada, Department of Indian and Northern Affairs, Institute for Environmental Studies, Pub. No. EE-14, Institute for Environmental Studies, University of Toronto, 1979.

Mackay, D., and S. Paterson, The physical properties of fresh and weathered crude oils. A report to Environment Canada, Arctic Marine Oilspill Program in fulfillment of DSS Contract No. 05097-00133.

Mackay, D. and K. Hossain, 1980. Studies of oil sedimentation, Proceedings of the Third Arctic Marine Oilspill Program Technical Seminar, Edmonton, Alberta, June 3-5, 1980.

Mackay, D. and S. Paterson, 1980. Program for Simulating Oil Property Changes During Weathering, Proceedings of the Third Arctic Marine Oilspill Program Technical Seminar, Edmonton, Alberta, June 3-5, 1980.

Mackay, D., Ng. T.W., Shiu, W.Y., D. Reuber, 1980. The degradation of crude oil in northern soils. A report prepared for the Arctic Land Use Research Program, Northern Environmental Protection and Renewable Resource Branch, Dept. of Indian Affairs and Northern Development, and published as Environmental Studies, No. 18, 1980.

Cohen, Y., Mackay, D. and W.Y. Shiu, 1980. Mass transfer rates between oil slicks and water, Can. J. Chem. Eng. 58, p. 569.

Mackay, D., and F. Szeto, Effectiveness of oil spill dispersants - development of a laboratory method and results for selected commercial products. Institute for Environmental Studies, University of Toronto, Pub. No. EE-16.

Mackay, D., Wells, P.G., Shiu, W.Y., Chau, E., and S. Abernethy, "A study of some physico-chemical factors influencing the acute toxicity of oil-dispersed mixtures", Report prepared for Environment Canada under DSS Contract No. 0350 KE204-9-0555.

Time Frame: This work is proceeding indefinitely.

Undertaken By: Work undertaken by Research Staff.

Funded by: Funded by various sources including EPS, DIAND, PACE, APOA, Exxon, BP, Imperial Oil, Dome Petroleum, US Coast Guard.

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University of Toronto
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Telephone: 416-978-4019

Project: SUB-SEABOTTOM PERMAFROST MAPPING - BEAUFORT SEA.

Geographic Area: Southern Beaufort Sea.

Objectives:

- 1) To map distribution of sub-seabottom permafrost by seismic methods.
- 2) To estimate ice-content, lithology and temperature characteristics of sub-seabottom permafrost.
- 3) To develop high resolution seismic methods for improved mapping of permafrost.

Approach Progress:

- a) Seismic surveys have been carried out in the Beaufort Sea since 1972 to obtain velocity-depth data on sub-seabottom permafrost.
- b) Industry and government seismic data has been analyzed and a preliminary distribution map for ice-bonded permafrost in the Southern Beaufort Sea has been published.
- c) Shallow drilling and associated temperature measurements and geophysical logging has been carried out in permafrost at over 30 sites offshore.
- d) Laboratory measurements of acoustic velocities, electrical resistivity and thermal conductivity have been carried out on permafrost samples from the Beaufort Sea.
- e) A detailed compilation of seismic data is currently underway to update existing permafrost maps in the Beaufort Sea. Completion is scheduled for April, 1984.
- f) A seabottom seismic refraction tool is currently being tested in the Beaufort Sea. This device has been designed to obtain detailed refraction velocity measurements of ice-bonded permafrost to a depth of 20 m below sea-bottom. If the tests are successful this device can be used to obtain detailed ice-content and depth structure along proposed marine pipeline routes.

Reports: Selected Publications (since) 1976:

Judge, A.S., MacAulay, H.A. and Hunter, J.A. 1976. Anomalous shallow seismic velocities in Mackenzie Bay, N.W.T.: Geol. Surv. Can., Paper 76-1A, p. 481-484.

Hunter, J.A. and Veillette, J. 1976. Borehole density logging in permafrost, Tuktoyaktuk, N.W.T.: Geol. Surv. Can., Paper 76-1A, p. 417.

Hunter, J.A., Judge, A.S., MacAulay, H.A., Good, R.L., Gagné, R.M. and Burns, R.A. 1976. Permafrost and frozen sub-seabottom materials in the southern Beaufort Sea: DOE. Beaufort Sea Project Technical Report #22, 174 p.

A 174 page report summarizing five years' work in the Beaufort Sea area with comments on the drilling problems to be encountered with respect to permafrost.

Judge, A.S., MacAulay, H.A. and Hunter, J.A. 1976. An application of hydraulic jet-drilling techniques to mapping of sub-seabottom permafrost: Geol. Surv. Can., Paper 76-1C, p. 75-82.

Kurfurst, P.J. and Hunter, J.A. 1976. Geological and geophysical surveys - Willowlake River, N.W.T.: Geol. Surv. Can., Paper 76-1C, p. 161-174.

Sackinger, W.M., Barnes, P.W., Harrision, W.D., Hopkins, D.M., Hunter, J.A., John, H.O., Johansen, N., Judge, A.S., Lackenbruch, A.H., Lewellen, R.I., Mackay, J.R., Marshall, V., Perre, T.L., Reimnitz, E., Sellmann, P.V. and Wheeler, J.A. 1976. Problems and priorities in offshore permafrost research: National Academy of Sciences, Washington, D.C., 43 p.

Scott, W.J. and Hunter, J.A. 1977. Applications of geophysical techniques in permafrost regions: Can. J. Earth Sci., Vol. 14, No. 1, p. 117-127.

Hunter, J.A., Neave, K.G., MacAulay, H.A. and Hobson, G.F. 1978. Interpretation of sub-bottom permafrost in the Beaufort Sea by seismic methods. Part I - Seismic refraction methods: in Proc. of III International Permafrost Conference, Edmonton, Alberta, July 10-13, 1978, Vol. 1, p. 515-520.

Hunter, J.A., Neave, K.G., MacAulay, H.A. and Hobson, G.F. 1978. Interpretation of sub-bottom permafrost in Beaufort Sea by seismic methods. Part II - Estimating the thickness of the high-velocity layer: in Proc. of III International Permafrost Conference, Edmonton, Alberta, July 10-13, 1978, Vol. 1, p. 521-526.

Neave, K.G., Judge, A.S., Hunter, J.A. and MacAulay, H.A. 1978. Offshore permafrost distribution in the Beaufort Sea as determined from temperature and seismic observations: Geol. Surv. Can., Paper 78-1C, p. 13-18.

Hunter, J.A., and Blasco, S.M. 1979. High resolution marine geophysics in Canada - A review: in proc. of the First Canadian Conference on Marine Geotechnical Engineering, Calgary, Alberta, April 25-27, 1979.

Hunter, J.A., Burns, R.A., Good, R.L. and Harrison, T.E. 1979. Seabottom seismic refraction array designs: Geol. Surv. Can., Paper 79-1C.

MacAulay, H.A., Judge, A.S., Hunter, J.A., Burgess, M., Gagné, R.M., Allen, V., and Burns, R.A. 1979. A study of sub-seabottom permafrost in the Beaufort Sea, Mackenzie Delta, by hydraulic drilling methods: Geol. Surv. Can., Open File #624 and Earth Physics Branch Open File - 79-11.

Hunter, J.A., MacAulay, H.A., Gagné, R.M., Burns, R.A., Harrison, T.E. and Hawkins, J.P. 1979. Hydraulic jet drilling operations at Illisarvik-geological and geophysical logs: NRC Technical Memorandum.

Neave, K.G., Judge, A.S. and Hunter, J.A. 1979. Offshore permafrost distribution in the Beaufort Sea as determined from temperature and seismic observations: NRC Technical Memorandum No. 124, p. 168-182.

Hunter, J.A., editor. 1979. Drained lake experiment for study of the growth of permafrost in the Western Arctic: Internal report prepared for the NRC Permafrost Sub-committee.

Scott, W.J., Sellmann, P.V. and Hunter, J.A. 1979. Geophysics in the study of permafrost: in Proc. of the III International Conference on Permafrost, July 10-13, 1978, Edmonton, Alberta, NRC, Vol. 2, p. 93-115.

Time Frame: This project is on-going.

Undertaken Terrain Geophysics Section
By: Resource Geophysics and Geochemistry Division
Geological Survey of Canada, Energy, Mines & Resources

Research Personnel: Dr. J.A. Hunter, H.A. MacAulay, Dr. C.E. Waboso, R.A. Burns, R.L. Good, R.M. Gagné, Dr. J.L. Morack (visiting profesor U. of Alaska) (1982-1983).

Funded by: i) A-level budget GSC
ii) National Energy Program Funding

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Geological Survey of Canada
601 Booth Street
Ottawa, Ontario K1A 0E8

Project: HUDSON STRAIT SEABIRD STUDY - YEAR 2 OF 3

Geographic Hudson Strait and vicinity
Area: Coats Island
Digges Sound
Akpatok Island

Objectives: To determine colony populations and basic breeding ecology of the major Thick-billed murre colonies in Hudson Strait.

Progress Part of a long-term monitoring program examining population
and dynamics of seabirds in Northern Canada. Background
Reports: investigations are listed in Seabird Report List. March, 1981.
Seabird Research Unit. Canadian Wildlife Service.

Time Frame: 15 June - 15 August 1981.

Undertaken Canadian Wildlife Service (CWS) - HQ Ottawa
By: - Atlantic, Environment Canada

Research Personnel: Dr. A.J. Gaston, CWS-HQ project leader.

Funded by: Canadian Wildlife Service - HQ and Atlantic
Petro Canada (OLABS)
Polar Continental Shelf Project
DOE Baseline study Programs

Contact: Dr. A.J. Gaston Telephone: 819-997-1841
Co-ordinator Seabird Research
Migratory Birds Branch
Canadian Wildlife Service
Environment Canada
Ottawa, Ontario K1A 0E7

Project: SEABIRD POPULATION STUDIES IN LANCASTER SOUND AND VICINITY

Geographic Area: Coburg Island, Jones Sound
Baillarge Bay, Baffin Island
Cape Liddon, Devon Island.

Objectives: To determine the distributions, movements and survival rates of Thick-billed Murres and Northern Fulmars at Coburg Island (Cambridge Point), Southern Devon Island (Cape Liddon) and northern Baffin Island (Baillarge Bay).

Approach Progress: Part of a long-term monitoring program examining population dynamics of seabirds in northern Canada. Background investigations are listed in: Seabird Report List, Investigations associated with the program "Studies on Northern Seabirds". Canadian Wildlife Service, March 1981.

Reports: Selected publications from the "Seabird Report List":

Nettleship, D.N. and P.A. Smith. 1975. Ecological sites in northern Canada. Canadian Committee for the International Biological Programme, Conservation Terrestrial - Panel 9. Ottawa, 330 pp.

Nettleship, D.N. 1977. Studies of seabirds at Prince Leopold Island and vicinity, Northwest Territories: preliminary report of geological investigations. Canadian Wildlife Service Progress Note No. 73: 1-11.

Nettleship, D.N. 1977. Seabird resources of eastern Canada: status, problems and prospects. Pages 96-108 in: Mosquin, T. and C. Suchal and Habitats, 20-24 May 1976. Canadian Nature Federation, Special Publication No. 6, Ottawa, 185 pp.

Nettleship, N.D. and A.J. Gaston. 1977. Pelagic distribution of seabirds - Western Lancaster Sound and Barrow Strait. AIPP Preliminary Report 1977. INA ESCOM Report No. AI-09. 73 pp.

Nettleship, D.N. and A.J. Gaston. 1978. Patterns of pelagic distribution of seabirds in western Lancaster Sound and Barrow Strait, Northwest Territories. Canadian Wildlife Service Occasional Paper No. 39, 40 pp.

Linton, A. and D.N. Nettleship. 1977. Studies of Northern Fulmars (Fulmarus glacialis) at Prince Leopold Island, Northwest Territories, Summer 1976. CWS Manuscript Report. 124 pp.

Brown, R.G.B. 1978. Atlas of seabirds of Baffin Bay and adjacent sounds. CWS Manuscript Report. 32 pp.

Nettleship, D.N. 1978. Seabird research in northern Canada. CWS Manuscript Report for EM&R and DIAND "Government activities in the North" Ottawa, 3 pp.

Brown, R.G.B. 1978. Birds at sea: western Atlantic. Ibis 120(1): 116-117.

Nettleship, D.N. 1978. Population analysis of colonial nesting seabirds from photography. Ibis 120(1): 119.

Brown, R.G.B. 1978. Seabirds in the upwelling off Senegal, February-March 1976. Ibis 121(3): 283-292.

Gaston, A.J. and D.N. Nettleship. 1978. Population reduction of Thick-billed Murres Uria lomvia at Cape Hay, Bylot Island, Lancaster Sound, N.W.T. CWS Manuscript Report 16 pp.

Brown, R.G.B. and D.N. Nettleship. 1978. Canadian Wildlife Service Seabird Research Unit, pp. 217-226. Bedford Institute of Oceanography Biennial Review 77/78. Dartmouth. 267 pp.

Nettleship, D.N. 1978. The potential for recovery of marine organisms following an oil spill in Lancaster Sound and vicinity. Brief presented to: FEARO Public Hearings: Lancaster Sound Drilling Proposal by Norlands Petroleums Ltd, Session II, 28-30 November 1978, Pond Inlet, N.W.T. CWS Manuscript Report. 9 pp.

Nettleship, D.N. 1979. Canadian Wildlife Service Seabird Research Unit, 1978. CWS Manuscript Report for EM&R AND DIAND "1978-79 Government Activities in the North" (Advisory Committee on Northern Development DIAND Publication, Ottawa). 4 pp.

Nettleship, D.N., T.R. Birkhead, and A.J. Gaston. 1979. Reproductive failure among arctic seabirds associated with unusual ice conditions in Lancaster Sound 1978. CWS Manuscript Report. 31 pp.

Birkhead, T.R. & D.N. Nettleship. 1980. Census methods for murres Uria species - a unified approach. Canadian Wildlife Service Occasional Paper No. 39. 30 pp.

Bartonek, J.C. & D.N. Nettleship (Eds). 1979. Conservation of marine birds of northern North America. Papers from the International Symposium held at the Seattle Hyatt House, Seattle, Washington, 13-15 May 1975. U.S. Dept. of Interior, Fish and Wildlife Service, Washington, Wildlife Research Report 11. 319 pp.

- Gaston, A.J. 1980. Populations, movements and wintering areas of Thick-billed Murres Uria lomvia in Eastern Canada. Canadian Wildlife Service Progress Note No. 110: 1-10.
- Birkhead, T.R. & D.N. Nettleship. 1980. Reproductive biology of Thick-billed Murres Uria lomvia an inter-colony comparison. CWS Manuscript Report 30 (In Press: Auk)
- Nettleship, D.N. 1980. CWS Arctic Seabird Studies 1979. CWS Manuscript Report for EM&R and DIAND "Government Activities in the north", Ottawa. 3 pp.
- Birkhead, T.R. & D.N. Nettleship. 1980. The adaptive significance of egg size and laying date in Thick-billed Murres Uria lomvia L. CWS Manuscript REport. 23 pp. (In press: Ecology).
- Nettleship, D.N., S. Tingley and E. Greene. 1980. Avifauna of Prince Leopold Island, Northwest Territories, 1975-1978. CWS Manuscript Report 30 pp.
- Gaston, A.J. & D.N. Nettleship. 1980. The Thick-billed Murres Uria lomvia of Prince Leopold Island - a study of the breeding ecology of a colonial high arctic seabird, CWS Manuscript Report. 616 pp. (In press: Canadian Wildlife Service Monograph Series No. 6).
- Nettleship, D.N. 1980. A guide to the major seabird colonies of eastern Canada: Identity, distribution and abundance. CWS Manuscript Report. 133 pp.
- Bradstreet, M.S.W., D.N. Nettleship, D.D. Roby & K.L. Brink. 1980. Diet of Dovekie Alle alle chicks in northwest Greenland. CWS Manuscript Report. 31 pp.
- Brikhead, T.R. & D.N. Nettleship. 1980. Baseline information for a Thick-billed Murre monitoring system at Cambridge Point, Coburg Island and Cape Hay, Bylot Island, N.W.T., Canada. CWS Manuscript Report 12 pp.
- Gaston, A.J. & D.N. Nettleship. 1981. Factors determining seasonal changes in attendance at colonies of the Thick-billed Murre Uria lomvia. CWS Manuscript report. 10 pp.
- Brown, R.G.B. and D.N. Nettleship. 1981. The biological significance of polynyas to Arctic colonial seabirds. CWS Manuscript Report. 24 pp. (In press: Canadian Wildlife Service Occansional Paper No. 45).
- Roby, D.D., K.L. Brink, and D.N. Nettleship. 1980. Measurements, chick meals and breeding distribution of Devekies (Alle alle) in Northwest Greenland. CWS Manuscript Report. 30 pp. (Submitted: Arctic).

Gaston, A.J. 1980. Seabird investigations in Hudson Strait -
Report on activities in 1980. CWS Manuscript Report. 36 pp.

Time Frame: 15 August - 4 September 1981

Undertaken Canadian Wildlife Service, HQ Ottawa,
By: Canadian Wildlife Service, Atlantic,
Environment Canada.

Research Personnel: Dr. A.J. Gaston and Dr. D.N. Nettleship
CWS.

Funded by: Polar Continental Shelf Project and Canadian Wildlife Service

Contact: Dr. D.N. Nettleship Telephone: 902-426-3274
Seabird Research Unit
Canadian Wildlife Service, DOE
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia B2Y 4A2

Dr. A.J. Gaston Telephone: 819-997-1841
Co-ordinator, Seabird Research
Migratory Birds Branch
Canadian Wildlife Service, DOE
Ottawa, Ontario
K1A 0E7

Project: FRONTIER SUBSEA PILOT PRODUCTION PROJECT (BEAUFORT).

Geographic Area: Beaufort Sea.

Objectives: Feasibility study of seasonal and year-round production systems for oil and gas production in the Canadian and U.S. Beaufort Sea out to 100-m water depth. Selected the optimum field development scenario and identified areas where further development of the technology would be required. Analysed the environmental impact of the proposed schemes and evaluated the risks and consequences of an oil spill. Also evaluated the effects of thermal pollution, dredging, ice-breaking, underwater noise, physical presence of artificial structures and ships, and human presence.

Approach (a) in-house expertise;
Progress: (b) thorough review of existing literature.

Reports: Two-volume report (Phase I).

Time Frame: Completed, 92 man months.

Undertaken By: CanOcean Resources Ltd.
Project Engineer - Ulf Topf.

Funded by: Dept. Industry, Trade and Commerce - Govt. of Canada
Dome Petroleum
Mobil Oil
Petro-Canada
U.S.G.S. - U.S. Dept. of Interior

Contact: John English, P. Eng. Telephone: 604-524-4451
Manager of Communications and Sales Coordination
CanOcean Resources Ltd.
New Westminster, B.C.
V3M 5P8

Project: EXTENDED WELL PRODUCTION TEST RISER SYSTEM FOR DOME PETROLEUM.

Geographic Area: Beaufort Sea

Objectives: Conceptual design of a riser system for long-term production testing of Beaufort Sea oil wells.

Approach (a) in-house expertise
Progress: (b) thorough review of existing literature.

Reports: Extended Well Production Test riser System for Dome Petroleum
- Document No. 500135, December 1980, (Single Volume).

Time Frame: Completed.

Undertaken CanOcean Resources Ltd.
By: Project Engineer - Peter Gibb.

Funded by: Dome Petroleum Ltd.

Contact: John English, P.Eng. Telephone: 604-524-4451
Manager of Communications and Sales Coordination
CanOcean Resources, New Westminster, B.C.
V3M 5P8

Project: THE FEASIBILITY OF UNDERWATER CONTAINMENT OF SUBSEA OIL SPILLS IN ARCTIC WATERS. (Oil spill containment study - 1979).

Geographic Area: Canadian Arctic regions including Beaufort Sea, Arctic Islands, Baffin Island area, and Labrador Coastal area.

Objectives: Review fourteen ideas and concepts (13 obtained from literature search and one conceived during the study) for the containment and disposal of spilled oil from an assumed blowout under three different scenarios in the Canadian Arctic.

Approach (a) in-house expertise;
Progress: (b) thorough review of existing literature.

Reports: The Feasibility of Underwater Containment of Subsea Oil Spills in Arctic Waters, March 1979.

Time Frame: Completed.

Undertaken CanOcean Resources Ltd.
By: Project Engineer: K.W. Chen.

Funded by: Research and Development Division
Environmental Emergency Branch
Environmental Protection Service
Fisheries and Environment Canada.

Contact: John English, P.Eng. Telephone: 604-524-4451
Manager of Communications and Sales Coordination
CanOcean Resources Ltd.
New Westminster, B.C.

Project: SUBSEA CONTAINMENT STUDY TASK 3. (C-CORE: 426-0)

Geographic Area: Offshore East Coast Canada in water depths to 180 m and in the Southern Beaufort Sea.

Objectives: Dome Petroleum is conducting a study to develop a collector and riser(s) system that could be suspended over a subsea wellhead to collect oil and/or gas leakage and direct it to the surface. CanOcean is presently negotiating with Dome to conduct an associated study to estimate the environmental loads placed on the system (collector, riser, surface components) and to estimate its mooring requirements.

Approach Contract not yet awarded.

Progress: Approach would be: (a) in-house expertise;
(b) thorough search of existing literature

Reports: Not yet determined.

Time Frame: Est. time of completion - September 1981.

Undertaken By: CanOcean Resources Ltd. Project Engineer.

Funded by: Dome Petroleum Ltd.
C-CORE

Contact: John English, P.Eng. Telephone: 604-524-4451
Manager of Communications and Sales Coordination
CanOcean Resources Ltd.
New Westminster, B.C.

Project: DESIGN STUDY OF OIL SKIMMER FOR USE IN CANADIAN WATERS
(C-CORE/Canadian Coast Guard Oil Skimmer Study).

Geographic Area: Equipment designed to operate in open (i.e., no ice cover) water.

Objectives: To conduct a detail design study for the development of a prototype oil skimmer suitable for use in Canada's offshore areas.

Approach (a) in-house expertise;
Progress: (b) thorough review of existing literature and skimmer designs.

Reports: Unfinished.

Time Frame: 2-3 months from time of proposal acceptance.

Undertaken By: CanOcean Resources Ltd. - Newfoundland
Project Engineer - Chris Bailey.

Funded by: C-CORE
Canadian Coast Guard
Canadian Government

Contact: John English, P.Eng. Telephone: 604-524-4451
Manager of Communications and Sales Coordination
CanOcean Resources Ltd.
New Westminster, B.C.

Project: ARCTIC PILOT PROJECT (A.P.P.)

Geographic Area: Melville Island and surrounding area.

Objectives: The A.P.P. is a system for the delivery of natural gas from Northern Melville Island to an LNG liquefaction plant and port facility on the South Coast of the Island. From there, the LNG will be transported to Southern markets in Canada in ice-breaking LNG carriers operating on a year-round basis. CanOcean is presently involved with the A.P.P. consortium on various aspects of the project including the design of the LNG loading facilities, LNG carriers, and pipelines. In addition, CanOcean is the NOVA representative at many of the consortium working committee meetings.

Approach (a) in-house expertise;
Progress: (b) thorough review of existing literature.

Reports: Not yet determined.

Time Frame: Ongoing

Undertaken CanOcean Resources Ltd.
By: Project Engineers - Manfred Schaper, Peter Metcalf.

Funded by: Arctic Pilot Project (A.P.P.) consortium consisting of:
Dome Petroleum
Petro-Canada
TransCanada Pipeline
Melville Shipping
PanArctic
NOVA, An Alberta Corporation

Contact: John English, P.Eng. Telephone: 604-524-4451
Manager of Communications and Sales Coordination
CanOcean Resources Ltd
New Westminster, B.C.
V3M 5P8

Project: 4TH SERVICE SYSTEM DESIGN. (Arctic Service System - In-House R & D)

Geographic Area: Variety of offshore areas, including Canada's Arctic and East Coast areas.

Objectives: To design an offshore service system that would be suitable for supporting subsea operations in a variety of areas including the Beaufort Sea, Arctic Islands, and Canadian East Coast offshore areas.

Approach
Progress: (a) in-house expertise based on more than a decade of experience at operating offshore service systems;
(b) thorough review of existing literature;
(c) thorough evaluation of other existing or planned service systems.

Reports: None.

Time Frame: Service System to be available '88-'89.

Undertaken
By: CanOcean Resources Ltd.
Project Engineer, Ernie Sjöholm.

Funded by: In-house research and development.

Contact: John English, P.Eng. Telephone: 604-524-4451
Manager of Communications and Sales Coordination
CanOcean Resources Ltd.
New Westminster, B.C.
V3M 5P8

Project: NATIONAL ENERGY PROGRAM - ENERGY R&D: OIL AND GAS TASK
3.26 OFFSHORE TEMPERATURE STUDIES

Geographic Area: Offshore Beaufort Sea

Objectives: Map distribution and characteristics of sub-sea permafrost

Approach Several drilling projects completed and short holes
Progress: instrumented.

Reports: See Agency Information Sheet (Section I, G2-3)

Time Frame: To 1984 under NEP if approved.

Undertaken Division of Seismology and Geothermal Studies
By: Earth Physics Branch
Dept. of Energy, Mines & Resources

Research Personnel: Dr. A. Judge, Mr. A. Taylor, Ms. M.
Burgess.

Contact: Dr. A. Judge Telephone: 613-995-5490
Mr. A.E. Taylor 613-995-5467
Ms. M. Burgess
Earth Physics Branch
Division of Seismology and Geothermal Studies
1 Observatory Crescent
Ottawa, Ontario K1A 0Y3

Project: NATIONAL ENERGY PROGRAM - ENERGY R&D: OIL AND GAS TASK
7.6 STUDY OF SHALLOW THERMAL ASPECTS FOR PIPELINING

Geographic Area: Offshore Beaufort Sea

Objectives: Field study of shallow thermal regime, seasonal freezing of sediments.

Approach Progress: Several ship cruises to investigate regional aspects.

Reports: See Agency Information Sheet (Section I, G2-3)

Time Frame: To 1984 under NEP if approved.

Undertaken By: Earth Physics Branch, Division of Seismology and Geothermal Studies, Dept. of Energy, Mines and Resources

Research Personnel: Dr. A. Judge and Mr. A. Taylor

Contact: Dr. A.S. Judge Telephone: 613-995-5490
Mr. A. Taylor 613-995-5467
Earth Physics Branch
Division of Seismology and Geothermal Studies
1 Observatory Crescent
Ottawa, Ontario K1A 0Y3

Project: NATIONAL ENERGY PROGRAM - ENERGY R&D: OIL AND GAS TASK
3.1 FUNDAMENTAL STUDIES OF MOISTURE MIGRATION

Geographic Area: Northern Canada, on- and off-shore

Objectives: Moisture Migration Phenomenon in Frozen Soils -
Through contract research to develop an improved understanding of the nature of and factors governing the moisture content of frozen soils and its mobility, for the improved design of major civil engineering work such as pipelines.

Approach Laboratory and controlled environment studies
Progress: Field studies commencing 1981-82.

Reports: See Agency Information Sheet (Section I, G2-3)

Time Frame: 1981-1984

Undertaken By: Division of Seismology and Geothermal Studies, Earth Physics Branch, Dept. of Energy, Mines and Resources.
Research Personnel: Dr. A. Judge, Ms. M. Burgess

Funded by: Agency: Earth Physics Branch, EMR
Scientific Authority: Dr. A Judge

Contact: Dr. A.S. Judge Telephone: 613-995-5490
Ms. M. Burgess 613-995-5467
Earth Physics Branch
Division of Seismology and Geothermal Studies
1 Observatory Crescent
Ottawa, Ontario K1A 0Y3

Project: NATIONAL ENERGY PROGRAM ENERGY R&D: OIL AND GAS TASK
2.2 GEOLOGICAL AND GEOPHYSICAL STUDIES OF GAS HYDRATES

Geographic Area: Northern Canada

Objectives: Gas hydrates: To improve understanding of the distribution and nature of gas hydrates sufficient to predict or determine their presence, assess their risk to drilling and production and examine their role in long-term gas resources.

Approach Progress: Laboratory and Analysis of Well-Logs

Reports: Selected Publications relating to Gas Hydrates:

Clouter, M.J. and H. Kiefte, 1979. The acoustic properties of methane hydrate by Brillouin spectroscopy - a preliminary report. Earth Physics Br., Open-File 79-18, 18 pp., EMR.

Judge, A.S., 1976. Permafrost, hydrates and the offshore thermal regime. Geothermal Service Internal Report 76-7 11p. + diagrams.

Judge, A.S., 1976. Permafrost, Hydrates and the Offshore Thermal Regime, Tech. Memo No. 119, Assoc. Comm. Geotech. Res., NRC, 99-113.

Judge, A.S., 1980. Natural gas hydrates in Canada, Assoc. Comm. Geotech. Res. Tech. Memo. (in press).

Taylor, A.E., Wetmiller, R. and Judge, A.S., 1979. Two risks to drilling and production off the East Coast of Canada - Earthquakes and Gas Hydrates, in Proceed. Sympos. on Research in the Labrador Coastal and Offshore Regions, Memorial Univ. Press, p. 91-105.

Time Frame: Funded to 1984.

Undertaken By: Division of Seismology and Geothermal Studies, Earth Physics Branch, Dept. of Energy, Mines and Resources.

Research Personnel: Dr. A. Judge, Mr. A. Taylor

Funded by: Earth Physics Branch

Contact: Dr. A.S. Judge Telephone: 613-995-5490
Mr. A.E. Taylor 613-995-5467
Earth Physics Branch
Division of Seismology and Geothermal Studies
1 Observatory Crescent
Ottawa, Ontario K1A 0Y3

Project: WATER RESOURCES OFFICER - NORTHERN AFFAIRS PROGRAM, NORTHERN OPERATIONS BRANCH, DISTRICT OPERATIONS, INUVIK, N.W.T.

Objectives: To evaluate and make recommendations on existing and proposed water developments in the Inuvik District for which application has been made under the Northern Inland Water Act for the Arctic Waters Pollution Prevention Act.

As an inspector and pollution prevention officer, to inspect and report on water developments and investigate violations of the acts and Regulations; to determine and develop terms and conditions to be included in Licences and Authorizations for review by the District Manager; to conduct, supervise and report on field surveys, studies and data collection of water phenomena, and water use and waste disposal practices; to appraise reports and information submitted by licensees.

Approach
Progress: Environmental Inspections of the Inuvik Water Resource Office are made every 2-3 weeks in the summer and every 4-5 weeks in the winter.

Reports: Environmental Inspections reports. Annual Reports.

Time Frame: Continuing.

Undertaken
By: District Operations, Inuvik, N.W.T.
Northern Operations Branch, Northern Affairs Program, Dept. of Indian and Northern Affairs.

Contact: David W. Milani Telephone: 403-979-3361
Water Resource Officer
DIAND-NAP, P.O. Box 2100
Inuvik, N.W.T.

Project: NORTHERN TECHNOLOGY UNIT PROJECTS:

- Objectives:
1. An International Steering Committee responsible for preparation of the EPS publication entitled, Cold Climate Utilities Delivery Design Manual has been reactivated with N.T.U. being heavily involved as the leading agency. The original publication was written in 1978 and considerable updating is presently underway to incorporate the many technological advances which have come about. Publication of the updated version is targeted for the next fiscal year.
 2. Two Regional seminars on Northern Utilities Technology are planned for Montreal, Quebec and St. John's, Newfoundland (this fiscal year). The seminars will be like mini-conferences with the first day being prescheduled to discuss topics varying from on-site systems, water and wastewater services, to thermal conditions and remote camps. The second day is hoped to include presentations from speakers of the area to present current activities of more local interest.
 3. A Public Information Campaign on Water Conservation is to be conducted in conjunction with the Government of the Northwest Territories (GNWT). This information campaign involves travel to the five regional centers within the territories with presentation of two seminars at each location, one for a technical/administrative audience and one for the general and interested public. Water conservation technology alternatives and techniques will be presented along with the resultant benefits of reduced water consumption and wastewater flows.
 4. An evaluation of experiences to date on the operation and maintenance of shallow buried pipe systems is being initiated. The project objective is to collect information to aid managers and system designers to better select optimum systems, better predict and budget for ongoing O & M costs and operations.
 5. The Water Board of the Northwest Territories have requested the assistance of N.T.U. to determine the state-of-the-art of northern lagoon practice. The project objectives are to provide the Water Board Technical Committee sufficient information to more adequately review applications for license approval. The Water Board, due to their nature, are unable to provide financial support in this area, hence, the project is presently proceeding along the lines of a literature review.

A past activity of N.T.U. which is proving to be of considerable value to other areas in Canada is the development of the GNWT Water and Sanitation Computer Model, originally developed cooperatively by GNWT and N.T.U. A project now underway is to have this program mounted on the U of Alberta computer system, debug its operation and become familiar with its functioning. Follow-up would be to promote the use of the beneficial aspects of this program to other governments who have expressed an interest.

7. Another area where N.T.U. provides considerable effort is in providing technical assistance and advice for requests from within EPS, ODG's and outside engineering consultants. Examples of this service have been responses to requests from EPS Whitehorse regarding an evaluation they have been conducting on Whitehorse's lagoons, support information for Water Board hearings in the Yukon; assistance to the Manitoba District office to establish and prioritize activities in their project regarding the low level of infrastructure of northern DINA communities; technical advice to aid in a DINA, Yukon Region project to relocate the Whitehorse Indian Village; and, reviewing and commenting on reports and replies being prepared through EPS District Offices.

Reports:

Publication List - Northern Technology Unit, Papers, Reports and Presentations. July 1975 - April 1981.
Selected publications from above listing (1979)

Armstrong, B.C. and J.J. Cameron. 1979. "Annotated Bibliography on Northern Environmental Engineering 1976-77", Environment Canada, Environmental Protection Service, Ottawa, Economic and Technical Review Report. EPS 3-WP-79-1, 132 p.

Armstrong, B.C., D.W. Smith and J.J. Cameron. 1980. "Water Requirements and Conservation Alternatives for Northern Communities", Presented at: International Association on Water Pollution Research, Post Conference Seminar-PS4, Edmonton, Alberta, June 28, 29, 1980, 29 p.

Armstrong, B.C. and J.J. Cameron. 1981. "Water Conservation for Northern Communities", in: The Northern Community: A Search for a Quality Environment, Specialty Conference, Seattle, Washington, April 8-10, 1981, American Society of Civil Engineers, New York, pp. 529-543.

Cameron, J.J. and B.C. Armstrong. 1979. "Water and Energy Conservation Alternatives for the North", Northern Technology Unit, Environmental Protection Service, Edmonton, Alberta and Department of Local Government, Government of the Northwest Territories, Yellowknife, N.W.T., 231 p.

Cameron, J.J. and B.C. Armstrong. 1980. "Water Conservation Alternatives for the North", Environment Canada, Environmental Protection Service, Ottawa, Economic and Technical Review Report EPS 3-WP-80-2, 45 p.

Cameron, J.J. and B.C. Armstrong. 1980. "Water and Energy Conservation Alternatives for the North", in: Utilities Delivery in Northern Regions, Symposium, Edmonton, Alberta, March 19-21, 1979, Environment Canada, Environmental Protection Service, Ottawa, Economic and Technical Review Report EPS 3-WP-80-5, pp. 47-88.

Cameron, J.J. 1980. "Northwest Territories Water and Sanitation Systems Analysis Computer Program: A Cost-Effective Approach", Northern Technology Unit, Environmental Protection Service, Edmonton, Alberta and Department of Local Government, Government of the Northwest Territories, Yellowknife, N.W.T., 264 p.

Smith, D.W. (ed.). 1980. "Utilities Delivery in Northern Regions", Symposium, Edmonton, Alberta, March 19-21, 1979, Environment Canada, Environmental Protection Service, Ottawa, Economic and Technical Review Report EPS 3-WP-80-5, 31 papers, 542 p.

Steering Committee. 1979. "Cold Climate Utilities Delivery Design Manual", Environment Canada, Environmental Protection Service, Ottawa, Economic and Technical Review Report EPS 3-WP-79-2, 630 p.

Time Frame: Continuing.

Undertaken Northern Technology Unit
By: Environment Canada

Contact: Bryan Armstrong Telephone: 403-420-2560
Northern Technology Unit
804, 9942 - 108 Street
Edmonton, Alberta
T5K 2J5

Project: COASTAL CHARACTERISTICS OF THE NORTHWEST PASSAGE

Geographic Area: Alaska and Canadian Arctic Coast

Objectives: To provide shoreline data for the development of an EIS for northern marine transportation routes.

Approach Progress: As part of a continuing study of the environmental impacts of northern hydrocarbon developments, Dome Petroleum has contracted Woodward-Clyde to prepare a shoreline analysis of the coasts of the Northwest Passage. This study encompasses the coasts between the mouth of the Yukon River, Alaska, and Cape Henry Kater on Baffin Island, N.W.T., including Prince of Wales Strait, Viscount Melville Sound and Lancaster Sound.

The study will focus on a detailed description of the physical coastal character and of the shore-zone processes on a section-by-section basis. Examples of repetitive shoreline types that occur within the study region are illustrated and described.

Undertaken By: Woodward-Clyde Consultants.

Funded by: Dome Petroleum Ltd.

Contact: Dr. E.H. Owens Telephone: 604-381-5811
Woodward-Clyde Consultants
16 Bastion Square
Victoria, B.C. V8W 1H9

Project: REGIONAL ANALYSIS STUDY OF THE WESTERN ARCTIC ARCHIPELAGO
MARINE REGION #4

Geographic Area: Western Canadian Arctic

Objectives: Delineate potential sites for the establishment of National Marine Parks in the Western Arctic.

Approach
Progress: The region was described and mapped in terms of the various "natural themes" which exist within the Western Arctic. The theme categories relate to various oceanographic, geologic, physiographic, and biologic characteristics which are considered important for inclusion within a national park. Each natural theme is assessed for its representivity within the region (i.e., is it common, uncommon, rare, or exceptional?) and also its "naturalness" (i.e., the extent of alteration by man); by grouping these assessments in a matrix form, a ranking of park candidate regions was established. The list of candidate regions identified by this study will be used to select potential marine park sites on the basis of the selection criteria outlined in Parks Canada Policy.

Reports:

Time Frame:

Undertaken
By: Woodward-Clyde Consultants

Contracted/
Funded by: Parks Canada, Dept. of Environment.

Contact: Dr. E.H. Owens
Woodward-Clyde Consultants
16 Bastion Square
Victoria, B.C. V8W 1H9

Telephone: 604-381-5811

Project: PARKS ANALYSIS NATURAL REGION #26

Geographic Area: Baffin Island, N.W.T.

Objectives: Delineate potential sites for the establishment of National Parks on Baffin Island, N.W.T.

Approach
Progress: The region described and mapped in terms of the various "natural themes" (geology, physiography, climate, soils, hydrology, vegetation, etc.) which exist within the Natural Region (Baffin Island). Each of the natural themes is then assessed for its representivity within the region (i.e., is it common, uncommon, rare, exceptional?) and also its "naturalness" (i.e., the extent of alteration by man), and by grouping these assessments in a matrix form, a ranking of park candidate regions was established. The list of candidate regions identified by this study will be used to select potential national park sites on the basis of the selection criteria outlined in Parks Canada Policy.

Undertaken By: Woodward-Clyde Consultants.

Contracted/ Funded by: Parks Canada, Dept. of Environment.

Contact: Dr. E.H. Owens Telephone: 604-381-5811
Woodward-Clyde Consultants
16 Bastion Square
Victoria, B.C. V8W 1H9

Project: SHORELINE ANALYSIS, ALASKA & ARCTIC CANADA

Objectives: Definition of shoreline terrain characteristics and sensitivity for possible Arctic tanker route assessment and planning.

Approach
Progress: Woodward-Clyde Consultants has been requested to prepare a series of maps that define shoreline character for the coasts of Alaska and Canada north of 60°. The maps will be prepared from existing data and information and will be used to assess potential tanker routes and to evaluate the potential damage from tanker accidents.

Undertaken
By: Woodward-Clyde Consultants

Contracted/
Funded by: Arctic Sciences Ltd.

Contact: Dr. E.H. Owens Telephone: 604-381-5811
Woodward-Clyde Consultants
16 Bastion Square
Victoria, B.C. V8W 1H9

Project: COASTAL GEOLOGY MAPPING, CENTRAL SVERDRUP BASIN, NORTHWEST TERRITORIES

Objectives: Prepare a series of maps that define the physical shore-zone characteristics.

Approach
Progress: The maps to be prepared provide baseline environmental data on the geological and process characteristics of the coastal zone required for transportation, development and conservation planning. The relevant parameters will be interpreted from vertical aerial photography and from existing field data. The data will be coded and then synthesized so that the primary features of the shore-zone can be mapped at 1:125,000. The index of reliability will be prepared for each map sheet to identify data sources as well as to indicate unfamiliar deficiencies.

Undertaken
By: Woodward-Clyde Consultants

Contracted/
Funded by: Department of Energy, Mines and Resources, Geological Survey of Canada.

Contact: Dr. E.H. Owens Telephone: 604-381-5811
Woodward-Clyde Consultants
16 Bastion Square
Victoria, B.C. V8W 1H9

Project: BEAUFORT SEA COASTAL VIDEO-SURVEY

Geographic Area: Beaufort Sea-Mackenzie Delta, Yukon and N.W.T.

Objectives: To obtain low altitude aerial colour video-tapes of the entire Beaufort Sea coast from the Alaskan boarder to the Baillie Islands.

Approach Progress: As part of Dome Petroleum's contingency planning and oil spill preparedness in the Canadian Beaufort Sea, Woodward-Clyde Consultants has been retained to fly the entire coast of the southern Beaufort Sea in order to obtain colour video-tapes of the shore zone. These video-tapes will be used primarily as an information source on shore zone character, coastal processes, and beach sediments.

The tapes will be edited and will be annotated to (a) provide information on the coastal character and (b) to provide a commentary on shoreline protection and cleanup methods applicable for each section of the coast. The tapes will be segmented into short sections (5-10 minutes) so that sections of the VTR record could be easily replaced as various parameters, such as shore zone morphology, change or as the information base changes.

Undertaken By: Woodward-Clyde Consultants

Funded by: Dome Petroleum Limited.

Contact: Dr. E.H. Owens Telephone 604-381-5811
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Project: NORTHWEST PASSAGE VIDEO-TAPE SURVEY

Geographic Area: Northwest Territories, Canada

Objectives: To obtain low altitude colour video-tapes of the coasts of Viscount Melville Sound and Prince of Wales Strait for oil spill countermeasures.

Approach Progress: Woodward-Clyde Consultants was contracted to fly the coasts of the Northwest Passage to obtain video-tapes of the entire shore-zone. The tapes were edited and annotated to provide an audio-visual commentary on (a) the shore-line character and coastal processes, and (b) applicable and practical shoreline protection and cleanup countermeasures for oil spills. The tapes are segmented to provide a series of short (5-10 minutes) sections which can be updated or replaced in the future as the information base changes or as sections of coast are resurveyed.

Reports: A report on the coastal environments, primary shoreline types, and the coastal processes of the study area accompanies the tapes.

Undertaken By: Woodward-Clyde Consultants

Contracted/
Funded by: Dome Petroleum Ltd.

Contact: Dr. E.H. Owens Telephone: 604-381-5811
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Project: BIOS OIL SPILL

Geographic Area: Baffin Island, N.W.T.

Objectives: Conduct an experimental oil spill to determine the fate of stranded oil on Arctic beaches.

Approach Progress: Woodward-Clyde Consultants was contracted to undertake an experimental oil spill at Cape Hatt, Baffin Island, N.W.T. to determine the fate of stranded oil on arctic beaches. Oil was spilled at three different beach sites, a high-energy beach, a low-energy environment and a test plot. An aged oil and an oil in water emulsion was used for these experiments and approximately two barrels of oil was spilled at each of the six test plots. The primary objective of the experiment was to monitor physical, chemical, and volume changes of the spilled oil over a three-to four-year period. The study was part of the Baffin Island Oil-Spill (BIOS) project which is one phase of the Arctic Marine Oil-Spill Programme (AMOP).

A second aspect of the project was to prepare an experimental design for further phases of the project. This design focused upon the selection of appropriate experimental techniques to determine the applicability and effectiveness of selected shoreline cleanup methods for arctic environments. This phase would be conducted at the Cape Hatt site in 1981.

Undertaken By: Woodward-Clyde Consultants.

Contracted/
Funded by: Environmental Protection Service
Environment Canada.

Contact: Dr. E.H. Owens Telephone: 604-381-5811
Woodward-Clyde Consultants
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Project: APOA BEAUFORT SEA OIL SPILL WORKSHOP

Geographic Area: Inuvik and Tuktoyaktuk, N.W.T.

Objectives: Conduct a 3-day Training Workshop on the Protection and Cleanup of Shorelines following an Oil Spill.

Approach Progress: Canadian Marine Drilling Ltd., on behalf of the Arctic Petroleum Operators Association (APOA), has contracted Woodward-Clyde Consultants to present a training workshop for industry and government personnel involved in the protection and cleanup of shore-lines following an oil spill. The workshop is the fifth of this type to be presented in Canada and will be concerned primarily with the Beaufort Sea coasts. A focal aspect of the 3-day workshop is a series of field inspection visits to representative shore-line types, in order to apply the data and information presented in the lecture sessions.

Undertaken By: Woodward-Clyde Consultants

Funded by: Arctic Petroleum Operators Association

Contact: Dr. E.H. Owens Telephone: 604-381-5811
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Project: AMOP SPILL SITE SELECTION

Geographic Area: Baffin Island - Devon Island, N.W.T., Canada

Objectives: Recommend suitable oil spill experiment locations.

Approach
Progress: Woodward-Clyde Consultants has been contracted to locate and suggest suitable field sites for shoreline and nearshore experimental oil spills to be conducted in 1980. The sites will be in the north Baffin Island - east Devon Island region of the Canadian arctic. The proposed experimental spills are part of the Arctic Marine Oil Spill Project.

Undertaken
By: Woodward-Clyde Consultants.

Funded by: Environmental Protection Service
Environment Canada

Contact: Dr. E.H. Owens Telephone: 604-381-5811
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Project: EAMES ATLAS WORKSHOP

Objectives: Review Petro-Canada's Environmental Impact Statement studies on the northeast coast of Baffin Island.

Approach
Progress: Woodward-Clyde Consultants was awarded a contract to review Petro-Canada's Environmental Impact Statement studies on the northeast coast of Baffin Island. The studies will "set the standard" for future EIS work in the Canadian arctic. Included in the planned programme is the preparation of an atlas to supplement the EIS and to provide user-oriented information related to possible spill situations. The programme is part of the joint industry/federal government EAMES (Eastern Arctic Marine Environmental Studies) project for Lancaster Sound and Baffin Bay.

As part of the review, a 2-day workshop was organized to examine completed studies, to identify data and information gaps, and to outline a field programme for 1979 to address existing deficiencies.

Reports: The result of the workshop and a set of recommendations are presented as a summary report.

Undertaken
By: Woodward-Clyde Consultants.

Funded by: Petro-Canada

Contact: Dr. E.H. Owens Telephone: 604-381-5811
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16 Bastion Square
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Project: SOUTHEAST NEWFOUNDLAND OIL SPILL COUNTERMEASURES STUDY

Geographic Area: Mobil Oil Canada Ltd.

Objectives: A shoreline analysis to identify and map potential spill impacts and appropriate shoreline cleanup countermeasures.

Approach Progress: Mobil Canada is preparing detailed oil spill contingency plans as part of regulatory requirements for offshore exploration and production on the Grand Banks. As part of the spill planning, Woodward-Clyde is involved in a detailed shoreline analysis to identify the character of the coastal zone, potential spill impacts and suitable shore-zone cleanup countermeasures. A series of maps depict relevant shoreline and countermeasure information and the appropriate cleanup methods are described in detail in an accompanying manual. The maps are at a scale of 1:250,000, and are in a loose-leaf format for ease of use and replacement. One map set identifies the physical shore-zone character, settlements and access parameters. The second set identifies appropriate countermeasure strategies on a section-by-section basis and is intended for use in the development of regional contingency plans and of site-specific response strategies. In particular, sections of coast where cleanup would be either impractical and/or unnecessary are indicated on the countermeasure maps.

Undertaken By: Woodward-Clyde Consultants

Funded by: Mobil Oil Canada Ltd.

Contact: Dr. E.H. Owens
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Telephone: 604-381-5811

Project: TUKTOYAKTUK HARBOUR MASTER PLAN

Geographic Area: Northwest Territories

Objectives: To provide a framework to govern the expansion of the port infrastructure in support of offshore oil and gas exploration in the Beaufort Sea.

Approach Progress: The work was conducted in three phases following a strategic choice methodology. Given the biophysical sensitivity of the region, the plan commenced with an analysis of marine and terrestrial environmental constraints. Following this, several scenarios depicting economic growth trends were prepared, focusing on future harbour activity and cargo traffic patterns.

Potential development areas were then delineated. Access and municipal service requirements were identified, and collectively integrated within the overall subdivision plan. An analysis was undertaken of potential socio-cultural impacts arising from development, while mitigative measures were prepared to ameliorate environmental concerns.

Reports: Reports prepared for client: Government of Northwest Territories.

Time Frame: 1981

Undertaken By: Acres Consulting Services Limited
Vancouver, British Columbia

Contact: Mr. T.M. Wardle Telephone: 604-683-9141
Vice-President and Regional Manager
or
Dr. S. Brown Telephone: 604-682-9141
Acres Consulting Services Limited
8th Floor
800 West Pender Street
Vancouver, British Columbia
V6C 2V6

Project: TRANSPORTATION OF GAS AND OIL FROM THE ARCTIC ISLANDS

Geographic Area: Arctic Islands, Canada

Objectives: The objective of the study was to develop an understanding of the comparative economics of alternative methods of transporting oil and gas from the Arctic Islands.

Approach
Progress: The relative economic efficiency of various transport systems comprising existing and near-future modes, such as air, water, rail, pipelines and others were evaluated under assumptions of different consumption rates and markets. Air tankers, dirigibles, surface marine tankers, submarine pipelines, submarines, barge-tug combinations, along with feeder pipelines, air-cushion vehicles, rail and road systems were among the modes to be investigated.

The evaluation of alternative systems related primarily to costs, both capital and operating, but also considered the related geographic, climatic and environmental constraints together with labor opportunities and problems.

Reports: Report submitted to client.

Time Frame: 1979

Undertaken By: Acres Consulting Services Limited

Contracted/ Funded by: Transportation Development Agency, Montreal, Canada

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Acres Consulting Services Limited
480 University Avenue
Toronto, Ontario M5G 1V2

Dr. S. Brown Telephone: 604-683-9141
Acres Consulting Services
8th Floor, 800 West Pender Street
Vancouver, B.C. V6C 2V6

Project: LABORATORY STUDY OF HEAT TRANSFER AT ICE/WATER INTERFACE.

Geographic Area: Melville Island, Northwest Territories.

Objectives: The purpose of the experiments is twofold: to determine heat transfer coefficients at the ice/water interface, and to demonstrate the performance of a submerged jet diffuser in controlling ice growth.

Approach Progress: A special ice testing facility was constructed in Acres' laboratory consisting of an insulated flume which permits modeling the flow of water under a growing ice cover.

In a previous study, various ice management concepts were reviewed to determine the most appropriate method of suppressing ice growth for an Arctic LNG marine terminal. Use of the process plant waste heat was found to be most suitable. Several computer programs were developed to determine the end-of-winter ice thickness as a function of heat input to the ice.

The first set of experiments measures the rate of heat transfer through the ice, with changes in water depth, flow velocity, ice thickness, surface roughness, and water salinity. The second set of tests models a scaled-down version of a single jet diffuser to verify the analytical approach used in the previous studies.

Reports: Report submitted to client.

Time Frame: 1979.

Undertaken By: Acres Consulting Services Limited
Niagara Falls, Ontario

Funded by: Petro-Canada

Contact: Dr. A.B. Cammaert Telephone: 416-354-3831
Acres Consulting Services Limited
5259 Dorchester Road
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L2E 6W1

Project: TANKER TERMINALS FEASIBILITY STUDY FOR A PETROCHEMICAL COMPLEX

Geographic Area: Coastal British Columbia

Objectives: To determine the feasibility of deepwater tanker terminals and related facilities for methanol and LNG.

Approach
Progress: These facilities are part of a petrochemical complex to produce 600 tons/d of methanol and 500 M scfd of LNG. Separate sites were studied for each product and a number of different locations examined. The Termpol guidelines were used for layout parameters and dredging. Maximum tanker size was 150,000-m³ cargo capacity. The scope of work included

- the development of conceptual general arrangements for each terminal type
- the selection and ranking of suitable sites for each terminal
- the examination of alternate ship mooring and loading systems
- the identification of areas of potential environmental conflict or special concern
- the development of capital and operating cost estimates
- the preparation of a milestone schedule for detailed engineering, procurement, construction and commissioning.

Reports: Report submitted to client.

Time Frame: 1980

Undertaken By: Acres Consulting Services Limited
Vancouver, British Columbia

Funded by: Confidential

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Acres Consulting Services Limited
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800 West Pender Street
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Project: FEASIBILITY STUDY, DEEPWATER TRANSSHIPMENT STORAGE FACILITY

Geographic Area: Conception Bay, Newfoundland.

Objectives: To conduct environmental and feasibility study.

Approach
Progress: An underground oil storage facility including a deepwater marine terminal to handle 500,000-dwt supertankers has been proposed for the abandoned Wabana Iron Mine on Bell Island, Conception Bay, Newfoundland. Acres carried out a feasibility study for the terminal as a basis for preparation of permit applications for approval by the Navigation Protections Act and the Termpol code. The work included preparation of capital cost estimates. As part of the study an investigation was conducted into navigation conditions in Conception Bay including the effects of weather, currents and ice.

Assessments were made of oceanographic and meteorological conditions including the field measurement of currents. A preliminary assessment was made of environmental considerations to be taken into account in planning the terminal.

Historical ice data were collected, collated and compared with comments of experienced mariners operating in the bay. This analysis produced statistics on the frequency and duration of ice conditions of various severities. The statistics were related to the ice navigation capabilities of supertankers and smaller tankers to obtain a quantified assessment of potential delays to both classes of vessel.

Reports: Submitted to client.

Time Frame: Completed.

Undertaken
By: Acres Consulting Services.

Funded by: Wabanex Energy Corporation Ltd.

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Niagara Falls, Ontario L2E 6W1

Project: RISK ANALYSIS FOR PIPELINE CONSTRUCTION.

Geographic Area: Mackenzie Valley

Objectives: The objective of this risk analysis was to develop and assess the relative merits, from a construction point of view of a 2-year, 2-1/2-year, and 3-year schedule.

Approach Progress: The approach was to develop contingency plans and assess the risk associated with each plan. The analysis included development of a decision model for use in ongoing studies. This model was used to make an assessment of the risk associated with potential variations of construction costs and completion dates from base plan estimates.

The results of the analysis, in addition to measuring risk in terms of time, money and resources, emphasized a positive attempt to reduce risk in three ways,
- analysis required the development of contingency plans, the assessment of contingency plan risk, and the development of further levels of contingency plans as necessary
- analysis encouraged modifications to base plans to achieve risk reduction for viable expected cost increases
- analysis promoted interdiscipline and interproject group communication.

Reports: Report submitted to client.

Time Frame: 1979

Undertaken By: Acres Consulting Services Limited
Niagara Falls, Ontario

Funded by: Canadian Arctic Gas Study Ltd.

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L2E 6W1

Project: OIL AND GAS PRODUCTION FACILITIES FOR OFFSHORE LABRADOR.

Geographic Area: Labrador (Offshore).

Objectives: To develop preliminary concepts for offshore oil and gas production.

Approach Progress: Study of offshore facilities for year-round production of oil and gas off the Labrador coast. In addition to exposure to the full force of Atlantic storms and waves, there are extreme ice conditions and icebergs which make year-round production an unprecedented operation. In the study consideration was given to methods of evading the impact of icebergs by locating drilling and production facilities below the seabed in caissons or tunneled excavations. The design of concrete/fill platform structures to withstand iceberg impact was also considered.

Reports: Submitted to client.

Time Frame: Completed.

Undertaken By: Acres Consulting Services (for Tri-Ocean Engineering).

Funded by: Total Eastcan Explorations Ltd.

Contact: Dr. A.B. Cammaert Telephone: 403-253-9161
Manager, Engineering Studies
Acres-Santa Fe Incorporated
Suite #450, 6712 Fisher Street S.E.
Calgary, Alberta T2H 2A7

Project: ICE MANAGEMENT FOR ARCTIC LNG TERMINAL.

Geographic Area: Melville Island

Objectives: Identification of potential ice management problems and the documentation of the present operators of ships and terminals in ice-infested waters.

Approach Progress: The study was concerned with ice management problems at Bridport Inlet, Melville Island, which is the proposed northern LNG terminal for the Arctic Pilot Project.

A number of potential solutions were investigated, such as icebreaker tug support, bubbler systems, thermal discharge systems, surface heat control, ice removal and ice diversion systems. These solutions were assessed in terms of cost, effectiveness, reliability, environmental and other effects, with the result that several were recommended for implementation.

The study also included an outline of possible field or laboratory programs which may be needed for further design data.

Reports: Report submitted to client.

Time Frame: 1979

Undertaken By: Acres Consulting Services Limited.
Niagara Falls, Ontario.

Funded by: Petro-Canada
Arctic Pilot Project

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Project: COMPILATION OF ICE FORCES AGAINST STRUCTURES

Geographic Area: Worldwide

Objectives: To develop an ensemble of ice force-time histories, generated from full-scale measurements on structures and small-scale laboratory tests.

Approach
Progress: The study involved a comprehensive literature review of ice-force measurement programs. Following compilation of a compendium of published ice-force measurements, researchers were contacted and original data records obtained.

A representative sample of records was selected for each of a number of different ice-structures interaction types. Detailed data were gathered regarding related ice strength, temperature, crushing velocity, etc. These data were then recorded on tape along with digitized points from the ice-force measurements. The objective of these data digitization was to assemble a data base of structural design parameters and to enable further analysis and stochastic generation of artificial ice-force records.

Reports: Report submitted to client

Time Frame: 1979

Undertaken
By: Acres Consulting Services Limited
Niagara Falls, Ontario.

Funded by: Confidential

Contact: Dr. A.B. Cammaert Telephone: 416-354-3831
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Project: ICE STUDIES FOR EXPLORATORY DRILLING SYSTEM

Geographic Area: Beaufort Sea

Objectives: To determine the potential for ice damage to a drill platform

Approach
Progress: An extensive review of available data from observations of the ice pack, controlled field testing and laboratory testing, as well as various theoretical analyses, were used to determine design loads for various structure types during both summer and winter conditions.

As part of this ice study the existing ice reconnaissance data was analyzed, and maps prepared with contours indicating annual periods with various probabilities of exceedance for a range of ice conditions.

Reports: Report submitted to client.

Time Frame: Completed.

Undertaken
By: Acres Consulting Services Limited
Niagara Falls, Ontario

Funded by: Arctic Petroleum Operators Association.

Contact: Dr. A.B. Cammaert Telephone: 416-354-3831
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Project: CROSSING OF SHIP TRACKS IN BARROW STRAIT.

Geographic Area: Barrow Strait, Northwest Territories.

Objectives: To identify possible methods to assist Inuit hunters to cross LNG ship tracks.

Approach Progress: A study was conducted on methods of crossing LNG ship tracks in Barrow Strait during the winter and spring months. Inuit hunters regularly travel across the ice in search of seal, caribou, polar bear and other game, and the proposed LNG ship transits through the strait may interfere with normal hunting practices.

The study involved the identification of all possible ship track crossing methods, the detailed assessment of a short list of solutions, and the development of a field testing program.

The short list of solutions included the use of aircraft, boats, vehicles, ice bridges and LNG ship maneuvers.

Reports: Submitted to client.

Time Frame: Completed.

Undertaken By: Acres-Santa Fe Incorporated.

Funded by: Arctic Pilot Project.

Contact: Dr. A.B. Cammaert Telephone: 403-253-9161
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Project: STRESS ANALYSIS OF BARROW STRAIT ICE COVER.

Geographic Area: Barrow Strait, Northwest Territories.

Objectives: The major objective of the study was to analyse the stress conditions in the ice cover in Barrow Strait and surrounding areas, due to the anticipated temperatures, wind and current loadings.

Approach Progress: The seasonal ice regime in the entire Parry Channel area was reviewed, and data on currents and wind conditions was summarized. The analysis was performed using a nonlinear finite element model, with computer plotting of stresses, displacements and crack tendencies.

It was determined that the lowering of the core ice temperature is the primary cause of the cracking of the ice sheet. The model results compared very favourably with observed crack patterns in the cover. The effect of continuous LNG carrier traffic along a selected shipping corridor was also evaluated, as well as the effects of an open water boundary in Lancaster Sound.

The study also involved a field investigation of ice cracks between Conwallis Island and Griffith Island, in Barrow Strait.

Reports: Submitted to client.

Time Frame: In progress, to be completed September 1981.

Undertaken By: Acres-Santa Fe Incorporated.

Funded by: Arctic Pilot Project.

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Project: PRODUCTION AND GATHERING SYSTEM, DESIGN AND PROJECT MANAGEMENT.

Geographic Area: Prudhoe Bay, Alaska.

Objectives: To provide Design Management and Support services for new production and gathering facilities.

Approach Progress: Project and construction management, engineering design (preliminary and detailed) and support services for the installation of new production and gathering facilities in the Prudhoe Bay oil producing area of Alaska. The project involved the expansion of existing facilities for connecting up to 60 additional wells. The design included well pad buildings and related infrasture, more than 161 km of flow lines and additional modules for three major crude-oil gathering centers. The approximate value of the project to the client was \$200 million.

Reports: Submitted to client.

Time Frame: Completed.

Undertaken By: Santa Fe Engineering Services Co.

Funded by: SDHIO Petroleum Company.

Contact: Mr. Y.M. Maurette Telephone: 403-253-9161
Vice President
Acres-Santa Fe Corporation
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Calgary, Alberta T2H 2A7

Project: ECONOMIC DEVELOPMENT PLAN

Geographic Area: Inuvik, Northwest Territories.

Objectives: Acres' is presently providing economic planning expertise to the Town of Inuvik's Economic Planning Committee for the design of an overall comprehensive economic development plan. The planning process will provide specific cost-benefit analysis as well as an on-going analysis and interpretation of government policies and their ramification and implications for the Town of Inuvik.

Approach Progress: An in-depth description and analysis of population, locational, and economic characteristics plus locational and population activity relationships will be presented with emphasis on key economic indicators. Based on this description of Inuvik's economic circumstances, an economic opportunity assessment will be conducted and a Model of Inuvik's Economic Community will be formulated. Growth projections related to the various development scenarios will be calculated to assist in establishing realistic economic development targets.

During the planning process, community involvement will be encouraged through work-shops and public information meetings. Finally, the economic development plan and strategy will provide new dimensions in terms of enterprise, base sector and non-base sector development and methods for increased local participation in Beaufort Sea resource developments.

Reports:

Time Frame: Ongoing.

Undertaken By: Acres Consulting Services Ltd.

Funded by: Town of Inuvik

Contact: Dr. Si Brown Telephone: 604-683-9141
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Project: OIL AND GAS EXPLORATION SUPPLY BASE

Geographic Area: Mackenzie Delta, Northwest Territories.

Objectives: The purpose of this ongoing study is to select an appropriate location for the establishment of a permanent 200-man supply base on the isolated coast of the Beaufort Sea. This base is to provide logistical offshore islands.

Approach Progress: Major components of the study include, investigations related to marine access and demise, environmental sensitivity, socio-economic implications and regulatory constraints affecting project approval.

Time Frame: Ongoing.

Undertaken By: Acres Consulting Services Ltd.

Funded by: Gulf Canada Resources Inc.

Contact: Dr. Si Brown Telephone: 604-683-9141
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Project: GEOTECHNICAL INVESTIGATIONS OF PROPOSED MACKENZIE HIGHWAY.

Geographic Area: Northwest Territories.

Objectives: Engineering investigation conducted between Mile 346 and Mile 450 on the proposed Mackenzie Highway.

Approach Progress: Engineering investigation required a review of all existing pertinent data, photogeologic analysis and mapping, field investigations including drilling and sampling along the centerline of the proposed highway and in borrow areas and the subsequent analysis, amalgamation and checking of all the data obtained.

Possible construction problems were studied in the light of the results of the field investigations.

A satisfactory location was selected for this section of the proposed highway in that the foundation soils were suitable for the subgrade and acceptable material was available for embankment construction.

It was determined that the highway could be constructed using normal design and construction techniques, though allowance would have to be made for the long cold winter season, the frost susceptible nature of some of the soils and the erodibility of the finer grained soils.

The permafrost was found to be neither extensive nor continuous and was determined to present no major problems in either road design or construction. Where permafrost occurred it was several feet below the ground surface and did not form any impediment to natural drainage.

River crossings were studied and found to be feasible using normal design and construction procedures.

Undertaken By: Acres Consulting Services Ltd.

Funded by: Department of Public Works

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Project: YUKON TERRITORY GRIZZLY BEAR STUDIES

Geographic Area: Yukon Territory

Objectives: Big-game hunting and hunting-related industry are very important economically in the Canadian North. Optimal management strategies, for species such as the grizzly bear, seek to maximize profit while minimizing impact on animal populations.

Approach
Progress: In the first part of this study, Acres carried out a survey of recent literature pertaining to the management of northern grizzly populations. Recent grizzly harvest statistics were obtained from the Yukon Territorial Government and these were analyzed to determine hunting trends over the last 20 years.

A computer-assisted model of population growth was then developed and used to project changes in population size and structure over a hypothetical 50-year period. Eight different harvest strategies were examined in this way and results used to make recommendations for acceptable levels of sport harvest in the Yukon.

Results indicated that the Yukon grizzly population is probably not seriously endangered by present harvest levels. Acres recommended that sport harvest be limited to 2 to 3 percent, depending on the management zone, and that hunt restrictions protecting the population's breeding potential be retained. It is also desirable that future zone management policy consider ecophysical criteria and that harvest statistics be collected from all kills.

Undertaken
By: Acres Consulting Services Ltd.

Funded by: Yukon Outfitters Association.

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Project: STUDY OF THE TOURISM POTENTIAL FOR THE MACKENZIE VALLEY COMMUNITIES

Geographic Area: Northwest Territories

Objectives: Comprehensive assessment of the potential and impact of tourism in five settlements in the Mackenzie Valley, as a result of the proposed Mackenzie Valley Highway to Inuvik.

Approach
Progress: The study included a review of the economic prospects of the area, an evaluation of the recreational resources of the settlements, and determination of the market for various tourism facilities. Demand projections, capital requirements and socio-economic impact were determined for campgrounds, motels, hotels, fishing and hunting lodges, attractions and parks.

Undertaken
By: Acres Consulting Services Ltd.

Funded by: Government of the Northwest Territories.

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Project: MARKET OPPORTUNITIES - NORTH OF 60 DEGREES

Objectives: This study for the Government of Alberta identified the major inputs that would be required in the North to fulfill some of the major infrastructure projects being planned for the region. These included the oil and gas pipelines, gas processing plants and oil and gas exploration.

Approach
Progress: All current transport flows were identified in order to define some of the current economic interactions between Alberta and the region north of 60 degrees. The impacts of the potential projects on these interactions were identified in the context of business development opportunities for Alberta.

Undertaken
By: Acres Consulting Services Ltd.

Funded by: Government of Alberta

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Project: TRANSPORTATION FEASIBILITY STUDIES

Geographic Area: Northern British Columbia and the Yukon

Objectives: Analysis of the effects of public investment in transportation facilities for Northern British Columbia and the Yukon, an area of approximately 350,000 square miles.

Approach
Progress: The work involved: preparation of an inventory of the potential forest and mineral resources of the area; analysis and assessment of the economic potential of these resources; assessment of probable resource developments during the next 10 years; analysis of the cost/benefit ratios, over a 25-year period, of a proposed railway to serve the area, the benefit values being based on estimate of the effects the proposed railway services might have on resource development.

The economic feasibility study of the railway was based on a computer simulation model that accommodated entries for: various routes for the railway; long-term demands and prices for forest and mineral products; effects of secondary transportation systems; timing of construction and development; effects of the development of secondary industries as a result of development of the two prime industries.

Undertaken
By: Acres Consulting Services Ltd.

Funded by: Government of Canada
Department of Transport

Contact: Dr. Si Brown Telephone: 604-683-9141
Acres Consulting Services Ltd.
8th Floor, 800 West Pender Street
Vancouver, B.C. V6C 2V6

Project: FINANCIAL ANALYSIS OF ARCTIC PIPELINE APPLICATIONS

Objectives: This assignment consisted of the examination and evaluation of detailed financial plans and technical proposals submitted by the major oil and gas companies in the Arctic Gas Consortium and Foothills Pipeline Group in support of their particular plan to construct a large diameter pipeline project to deliver gas from Alaska and the Mackenzie Delta area of Canada to markets in the southern United States and Canada.

Approach The range of investigations covered:

Progress:

- analysis of estimates of pipeline capital and operating costs;
- financing, capital structure, debt/equity;
- rate base, depreciation, taxes and rate of return;
- unit cost of service calculations;
- sensitivity analysis;
- pipeline utility tariff, rate design alternatives for several classes of service;
- assessment of proposed shipper contracts and service agreements;
- preparation of cross-examination and final argument based on the record of hearings before the Canadian National Energy Board.

Undertaken Acres Consulting Services Ltd.

By:

Funded by: Ontario Ministry of Energy

Contact: Dr. Si Brown Telephone: 604-683-9141
Acres Consulting Services Ltd.
8th Floor, 800 West Pender Street
Vancouver, B.C. V6C 2V6

Project: RADARSAT PROJECT

Geographic Area: The study area embraces all of Canada and its offshore areas with particular emphasis on the proposed Arctic oil and gas marine transportation corridors.

Objectives:

- 1) To perform the Phase A technical and economic studies necessary to define a radar satellite implementation program that would provide a limited operational capability to supply timely ice information for selected Arctic or east coast operations, and provide research data for developing applications to meet land and ocean requirements.
- 2) To develop Canadian industrial expertise in spaceborne radar technology through a research and development program, so that a radar satellite including radar systems and major subsystems in space and ground processing can be built in Canada.
- 3) To develop options for shared programs with ESA and NASA in addition to an all-Canadian program.

Approach Progress: An interdepartmental project office, staffed by EMR, DOC, DOE and DFO has been established at Ottawa. Preliminary reports on the mission requirements for operators and researchers in ice, oceans and land disciplines have been produced. Planning is underway for aircraft radar experiments this fall in the Beaufort Sea.

Reports: Canadian Synthetic Aperture Radar Satellite Program - E. Shaw, presented at Ann Arbor, Michigan, Remote Sensing Symposium, May 1981.

Time Frame: The current project time frame extends until March 1984. If the satellite program is approved, it would lead to a launch in 1988.

Undertaken By: Agencies: DOT, EMR, AES, DOE
Personnel: E. Shaw, K. Raney, E. Langham, R. Ramseier, J. Cihlar, R. Slaney, C. Mason, R. Warren, M. Palfreyman.

Contact: E. Shaw Telephone: 613-593-4457
Project Manager
Suite 200, 110 O'Connor Street
Ottawa, Ontario K1P 5M9

Project: OCEANOGRAPHIC MONITORING IN BARROW STRAIT

Geographic Area: Barrow Strait - Northwest Passage

Objectives: The general aim of this work is to collect information sufficient for documentation of the magnitude of short- and long-term variations in the physical, chemical and biological properties of the water in a section of the Northwest Passage.

Approach Progress: The project was initiated in March 1981. Field work, utilizing the stable winter ice cover, consisted of regional surveys of water structure and properties, intended to delimit spatial variations, and at certain sites, of repeated/continuous measurements to identify temporal variability in water structure, and chemical and biological properties, and water movements. CTD measurements were made at a network of 56 stations with year-long measurements of flow taken at a single site. A notable finding was evidence of coastal upwelling and retarded ice growth along the south shore of Barrow Strait. A limited number of biological, and chemical observations were made, however, this program will be enhanced during the 1982 field work.

Reports: Bennett, E.B. Arctic Oceanographic Data Report 1981 - Barrow Strait. Data Report Series No. 81-1. Central Region, Ocean Science and Surveys, Department of Fisheries and Oceans. Burlington, Ontario. (In preparation)

Brooks, D.J. Arctic Oceanographic Field Report 1981 - Barrow Strait. Field Report Series No. 81-1. Central Region, Ocean Science and Surveys, Department of Fisheries and Oceans, Burlington, Ontario. (In preparation)

Danard, M. and M. Gray. A simple procedure for calculating variations in atmospheric Pressure near a radiosonde station. Prepared for OSS under contract by Atmospheric Dynamics Corporation, Victoria, B.C. March 1981.

McClaren Plan Search. Data Report on biological and chemical oceanography - Barrow Strait. (In preparation)

Peck, G.S. 1977. Arctic Oceanographic Data Report, 1976: Penny Strait. Data Report Series #77-2, Ocean and Aquatic Sciences, Central Region, Canada Centre for Inland Waters.

Peck, G.S. 1978. Arctic Oceanographic Data Report, 1977: Western Viscount Melville Sound. Data Report Series #78-3, Ocean and Aquatic Sciences, Central Region, Canada Centre for Inland Waters.

Prinsenbergh, S.J. 1978. Arctic Oceanographic Data Report, 1978: Volume 1. Data Report Series #78-4, Ocean and Aquatic Sciences, Central Region, Canada Centre for Inland Waters.

Peck, G.S. 1980. Arctic Oceanographic Data Report 1978, Volume 2. Data Report Series #80-1, Ocean and Aquatic Sciences, Central Region, Canada Centre for Inland Waters.

Peck, G.S. 1980. Arctic Oceanographic Data Report 1979. Sverdrup Basin Volume 1. Data Report Series #80-2, Ocean and Aquatic Sciences, Central Region, Canada Centre for Inland Waters.

Peck, G.S. 1980. Arctic Oceanographic Data Report 1979. Sverdrup Basin Volume 2. Data Report Series #80-3, Ocean and Aquatic Sciences, Central Region, Canada Centre for Inland Waters.

Time Frame: Indefinite

Undertaken Government of Canada
By: Department of Fisheries and Oceans
Central Region, Ocean Science and Surveys
Research and Development Division
Burlington, Ontario.

Research Personnel: Dr. E.B. Bennett (Scientist in charge)
Dr. N.F. Watson

Contact: Dr. E.B. Bennett Telephone: 416-637-4354
Arctic Oceanographer
Department of Fisheries and Oceans
Central Region, Ocean Science and Surveys
P.O. Box 5050
867 Lakeshore Road
Burlington, Ontario
L7R 4A6

Project: ICE STUDIES IN THE CENTRAL ARCTIC

Geographic Area: Borden Peninsula on Baffin Island

Objectives: To develop sufficient understanding of radar signal's interaction with various types of ice (first-year, multi-year, open water, pressure ridges, etc.) in order that it can be classified from a surface vessel out to ranges of 5 to 6 miles.

Approach Progress: During March/April, 1981, a major investigative program was carried out to develop an understanding of the interaction of low incident angle radar signals with sea ice. Two radar frequency bands were investigated as well as effects of various pulse lengths, antenna beam widths, elevations above MSL and cross-polarization effects. Data collected was extensively ground truthed by detailed surface observations and aerial photography.

Although considerable progress has been achieved, major work is still required especially on investigating cross-polarized radar returns. A field program is planned for March/April 1982.

Reports: Lewis, E.O. Field Report (In preparation)
McMaster University - Data Report (In preparation)
Lewis, E.O. Analysis Report (by early 1982)

Time Frame: Time frame for entire program is 1981-1985.

Undertaken By: Government of Canada
Department of Fisheries and Oceans
Central Region, Ocean Science and Surveys
Research and Development Division
Burlington, Ontario.

Research Personnel: E.O. Lewis

Funded by: 1. Agency - McMaster University (Data Report Preparation)
2. Scientific Authority - E.O. Lewis

Contact: E.O. Lewis Telephone: 416-637-4356
Program Support
Department of Fisheries and Oceans
Central Region, Ocean Science and Surveys
867 Lakeshore Road
P.O. Box 5050
Burlington, Ontario

Project: G-UMPS (GYROSCOPE UNMANNED PROFILING SYSTEM).

Geographic Area: Canadian Arctic (Northwest Passage).

Objectives: To develop an unmanned profiling system for oceanographic data collection in areas of low magnetic field intensities.

Approach Progress: Vertical profiling of the water column from an ice cover for the measurement of current speed, current direction, water temperature and conductivity (density) was undertaken during the winter of FY 81/82 oceanographic field program in Barrow Strait. The measurement of the current direction is by far the most complicated.

It provides a wealth of information on current structure at a fraction of the cost and logistical effort of conventional methods. In Barrow Strait profile information indicates maximum currents occur at mid-depth, and the sense of rotation in the tidal ellipses is clockwise there but counter-clockwise near the ice and sea bottom. G-UMPS can handle hourly sampling at up to fifteen depths to 150m.

Future development is aimed at reducing the physical size and power requirements of the system and to incorporate the addition of other parameters to be measured, such as dissolved oxygen.

Reports: Baird, S.D. Internal Report and Journal papers are in preparation.

Time Frame: FY 83-84

Undertaken By: Government of Canada
Department of Fisheries and Oceans
Central Region, Ocean Science and Surveys
Research and Development Division
Burlington, Ontario.

Research Personnel: S.D. Baird

Funded by: Development is partially funded by the Ministry of Transportation.

Contact: S.D. Baird Telephone: 416-637-4707
Ocean Instrumentation
Department of Fisheries and Oceans
Central Region, Ocean Science and Surveys
867 Lakeshore Road
P.O. Box 5050
Burlington, Ontario L7R 4A6

Project: OCEANOGRAPHY OF HUDSON/JAMES BAYS

Geographic Area: Hudson Bay and James Bay

Objectives: To determine baseline conditions of salinity, temperature and currents and to assess the effects of man-made alterations of the seasonal runoff cycle as a result of ongoing hydroelectric developments on the circulation and biological regimes of the bays.

Approach Progress: Physical and biological oceanographic surveys carried out in Hudson Bay and James Bay during recent years provide baseline information on currents (tidal, wind-driven and density-driven modes), vertical stability (temperature and salinity profiles) and biological nutrient distributions during summer and winter months. Because of large variations found in time and space in current and CTD data, meaningful average values are hard to define.

Work will continue on monitoring oceanic parameters to define post-project conditions of circulation and stability, and biological study to identify species assemblages.

Reports: Prinsenber, S.J. 1977. Freshwater Budget of Hudson Bay. Manuscript Report Series No. 5. Central Region, Ocean and Aquatic Sciences. Burlington, Ontario.

Prinsenber, S.J. 1978. Analytical Study of the Circulation of James Bay. Manuscript Report Series No. 6. Central Region, Ocean and Aquatic Sciences. Burlington, Ontario.

Prinsenber, S.J. and R. Gottingen. 1979. Heat and Freshwater Contents in Hudson Bay and James Bay. Manuscript Report Series No.8. Central Region, Ocean and Aquatic Sciences. Burlington, Ontario.

Pullen, T.W. 1973. James Bay Data Report 1972. Marine Sciences Directorate Central Region, Environment Canada.

Peck, G.S. 1976. James Bay Data Report 1973. Central Region, Ocean and Aquatic Sciences, Burlington, Ontario.

Prinsenber, S.J. 1977. Hudson Bay Oceanographic Data Report 1975, Vol. 1. Data Report Series No. 77-1. Central Region, Ocean and Aquatic Sciences, Burlington, Ontario.

Peck, G.S. 1978. James Bay Oceanographic Data Report: Vol. 1. Winter, 1975 and 1976. Data Report Series No. 78-1. Central Region, Ocean and Aquatic Sciences, Burlington, Ontario.

Prinsenber, S.J. and D. Collins. 1979. Hudson Bay/Great Whale Oceanographic Data Report: Winter 1977. Data Report Series No. 79-3. Central Region, Ocean and Aquatic Sciences, Burlington, Ontario.

Prinsenber, S.J. and F.W. Deys. 1979. Hudson Bay Oceanographic Data Report, Vol. 2. Data Report Series No. 79-4. Central Region, Ocean and Aquatic Sciences, Burlington, Ontario.

Peck, G.S. 1976. A Summary of Ice Conditions in Hudson Strait, Hudson Bay and James Bay 1965-1971. Internal Report. Central Region, Ocean and Aquatic Sciences, Burlington, Ontario.

Baird, S.D. 1977. Hudson Bay 1976 Current Meter Data Summary. Central Region, Ocean and Aquatic Sciences, Burlington, Ontario.

Freeman, N.G. 1974. First James Bay Oceanographic Workshop. Ocean and Aquatic Sciences, Central Region, Environment Canada.

Prinsenber, S.J. Time Variability in Physical Oceanographic Parameters in Hudson Bay. Presented at the Hudson/James Bay Symposium, University of Guelph, April 18-30, 1981.

Prinsenber, S.J. Present and Future Circulation in James Bay. Presented at the Hudson/James Bay Symposium, University of Guelph, April 28-30, 1981.

External

Freeman, N.G. and T.S. Murty. 1976. Numerical Modelling of Tides in Hudson Bay. J. Fish. Res. Board Can. 33:2345-2361.

Prinsenber, S.J. Man-made Changes in the Freshwater Input Rates of Hudson and James Bays. Canadian Journal of Fisheries and Aquatic Sciences, Vol. 37, No. 7, pp. 1101-1110

Peck, G.S. 1976. Winter and Nearshore Oceanography of James Bay. Proc of the 1976 James Bay Environmental Symposium, Montreal, Quebec.

Prinsenber, S.J. 1976. Offshore Oceanography of James Bay. Proc. of the 1976 James Bay Environmental Symposium, Montreal, Quebec.

Danard, M. Meteorological Influences of Hudson Bay and James Bay. Prepared for OSS under contract by Atmospheric Dynamics Corporation, Elmira, Ontario. October 1980.

Danard, M., M. Ray and G. Lyv. Methods of Computing Surface Fluxes Over Hudson Bay and James Bay. Prepared for OSS under contract by Atmospheric Dynamics Corporation. Victoria, B.C. March 1971.

Estuarine

Budgell, W.P. Fortnightly Variations in the Salinity Distribution in Chesterfield Inlet. Presented at the Hudson/James Bay Symposium, University of Guelph, April 28-30, 1981.

Budgell, W.P. 1981. A Stochastic-Deterministic Model for Estimating Tides in Branched Estuaries. Manuscript Report Series No. 10. Department of Fisheries and Oceans, Ocean Science and Surveys, Burlington, Ontario.

Budgell, W.P. 1976. Tidal Propagation in Chesterfield Inlet, N.W.T. Manuscript Report Series No. 3. Ocean and Aquatic Sciences, Central Region, Canada Centre for Inland Waters. Burlington, Ontario.

Freeman, N.G., R.J. Pett and J.C. Roff. Physical, Nutrient and Seston Features of the Under-Ice La Grand River Plume, James Bay. Presented at the Hudson/James Bay Symposium, University of Guelph, April 28-30, 1981.

Time Frame: Field work is planned during summers to 1984.

Undertaken Government of Canada
By: Department of Fisheries and Oceans
Central Region, Ocean Science and Surveys
Research and Development Division
867 Lakeshore Road
Burlington, Ontario
L7R 4A6

Research Personnel: Dr. S.J. Prinsenberg, Mr. N.G. Freeman
Dr. N.F. Watson, Dr. W.P. Budgell

Contact: Dr. S.J. Prinsenberg Telephone: 416-637-4539
Physical Oceanographer
Department of Fisheries and Oceans
Central Region, Ocean Science and Surveys
Research and Development Division
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Project: HIRE NORTH EVALUATION STUDY

Geographic Area: Liard River Valley, Northwest Territories.

Objectives: An economic, social, management and training evaluation of a \$3 million/year native heavy construction training and native business development program in the N.W.T.

The approach includes an analysis of the training system, the curriculum and support measures, the financial management of Hire North, its organizational strengths and weaknesses, and a benefit-cost analysis of the results. The evaluation includes an intensive interviewing program of native participants in the project, and a computerized statistical analysis of the results.

Approach Progress: Study underway.

Reports: Final report in two volumes. First volume will present the results of the analysis in terms of accomplishments and/or failures in meeting the objectives. Second volume will provide a preliminary feasibility study of optional future approaches to the training of natives for employment with the highway project, the development of native businesses to provide services to the project, and the development of mechanisms for native involvement in the project management.

Time Frame: Scheduled completion in July, 1981.

Undertaken By: Interdisciplinary Systems Ltd., Calgary.

Funded by: Government of Northwest Territories, Dept. of Economic Development and Tourism.

Contact: Michael J. Vaselenak Telephone: 403-233-8545
Interdisciplinary Systems Ltd.,
601-633-6th Avenue S.W.
Calgary, Alberta
T2P 2Y5

Project: SOCIO-ECONOMIC IMPACT ASSESSMENT OF THE ARCTIC PILOT PROJECT
ON SELECTED HIGH ARCTIC COMMUNITIES.

Geographic Area: Eastern Arctic Archipelago: Resolute, Arctic Bay, Grise
Fiord, Pond Inlet.

Objectives: Conduct socio-economic assessment for Arctic Pilot Project
application.

Approach Completed
Progress:

Reports: Assessment of the socio-economic impacts of the Arctic Pilot
Project on selected high Arctic communities.

Time Frame: Completed 1978, updated 1980.

Undertaken Interdisciplinary Systems Ltd., Winnipeg.
By:

Funded by: Arctic Pilot Project

Contact: D.E. Epstein Telephone: 204-453-3745
Interdisciplinary Systems Ltd.
966 Waverley Street
Winnipeg, Manitoba
R3T 4M5

Project: ASSESSMENT OF THE SOCIO-ECONOMIC IMPACTS AND DAMAGES RESULTING FROM THE GRAND RAPIDS 1960-1980 (WITH PROJECTIONS TO YEAR 2000).

Geographic Area: Grand Rapids - Cedar Lake - The Pas area, Manitoba

Objectives: Document the social, economic and resource impacts of the forebay and construction of the Grand Rapids Hydroelectric Project on the Chemawawin (Easterville), Moose Lake, Grand Rapids, and The Pas Indian Bands. Damages will be calculated and compensation/mitigation requirements determined. IDS serves as Advisor to Legal Counsel for the Bands.

Approach Progress: Study underway

Reports: An evaluation of the Grand Rapids Forebay Agreements between the Manitoba Government and The Pas, Moose Lake and Chemawawin Indian Bands, 1980.

Time Frame: Estimated completion September 1981.

Undertaken By: Interdisciplinary Systems Ltd., Winnipeg.

Funded by: Wilson, Yerex, Young, Selinger and Webster, Legal Counsel, and Swampy Cree Tribal Council, The Pas, Manitoba.

Contact: D.E. Epstein Telephone: 204-453-3745
966 Waverley Street
Winnipeg, Manitoba
R3T 4M5

Project: CONSTRUCTION AND USE OF WINTER ROADS DURING PIPELINE CONSTRUCTION, TO REDUCE TERRAIN AND VEGETATION IMPACTS.

Geographic Area: Alaska, Yukon, N.W.T. in general, field tests at Quill Creek, Yukon.

Objectives: Evaluate use of various types of winter road (snow, ice-capped, ice aggregate) as work pads for pipeline construction and their effectiveness in protecting sensitive permafrost terrain. Conduct literature review, develop construction specifications and conduct field tests.

Approach Progress: Study underway. Note: A similar study was previously conducted at Norman Wells, N.W.T. in 1973.

Reports: Report on Norman Wells winter road research study, 1973. Snow and ice roads: ability to support traffic and effects on vegetation. K.M. Adam and H. Hernandez. 1977. Arctic 30 (1): 13-27.

Construction and testing of an ice aggregate work pad at Quill Creek testing facility (1981).

Time Frame: Scheduled completion - summer 1981.

Undertaken By: Interdisciplinary Systems Ltd., Winnipeg.

Funded by: For current study - Foothills Pipe Lines (Yukon) Ltd.
For 1973 study - Canadian Arctic Gas Study Ltd.

Contact: Dr. K.M. Adam Telephone: 204-453-3745
Interdisciplinary Systems Ltd.
966 Waverley Street
Winnipeg, Manitoba
R3T 4M5

Project: CANDIDATE NATURAL AREAS OF CANADIAN SIGNIFICANCE AND NATURAL SITES OF CANADIAN SIGNIFICANCE IN NATURAL REGION 8 AND IN NATURAL REGION 7.

Geographic Area: Region 8 - Mackenzie Mountains area in B.C., Yukon, N.W.T.
Region 7 - Northern Interior Plateau and Mountains in B.C., Yukon, N.W.T.

Objectives: Identify candidate Natural Areas and Natural Sites of Canadian Significance

Approach Progress: Completed

Reports: Report on Natural Areas of Canadian Significance and Natural Sites of Canadian Significance in Natural Region 7.

Report on Natural Areas of Canadian Significance and Natural Sites of Canadian Significance in Natural Region 8.

Time Frame: Completed December 1980.

Undertaken By: Interdisciplinary Systems Ltd., Edmonton.

Funded by: Parks Canada, Ottawa.

Contact: L.E. Hurwitz Telephone: 403-434-2372
Dr. A. Garbutt
Interdisciplinary Systems Ltd.
107, Centre 104
5240 Calgary Trail
Edmonton, Alberta T6H 5G8

Project: REGULATORY CONSULTING SERVICES TO PRIVATE INDUSTRY.

Geographic Area: Arctic Islands; Alberta, Saskatchewan; N.E. Alberta.

Objectives: Developed procedures for submission of applications, analysis of federal and provincial jurisdiction over engineering and environmental matters, review and revision of the regulatory logic network of the Alaska Pipeline Master Schedule for Alberta and Saskatchewan, and identification of critical regulatory paths. Provided a survey and evaluation of federal and Northwest Territories legislated environmental standards applicable to the Arctic Pilot Project. Provided advice on the development of plans and positions to be taken in regard to the socio-economic policies associated with Canstar Oil Sands Ltd. proposed tar sands plant. Socio-economic issues dealt with included provision of local business opportunities, manpower planning, local employment and equal opportunity measures.

Approach Completed.
Progress:

Reports: Survey reports, suggested procedures and strategies.

Time Frame: Completed. Spring 1981.

Undertaken Interdisciplinary Systems Ltd., Calgary.
By:

Funded by: Petro-Canada Ltd. (Arctic Pilot Project) Nova, an Alberta Corporation (Alaska Project Division)
Canstar Oil Sands Ltd.

Contact: Michael J. Vaselenak Telephone: 403-233-8545
Interdisciplinary Systems Ltd.
601-633-6th Avenue S.W.
Calgary, Alberta
T2P 2Y5

Project: BEAUFORT COASTAL SURVEY

Geographic Area: Tuk Peninsula or along Yukon Coast from MacKenzie Delta to Herschel Is.

Objectives: The concept of this coastal survey is to measure the degree and pattern of spatial variability in the marine nearshore environment. Emphasis will be placed on consistency of methodology at each site and sufficient replication to allow statistical comparison within transects, between depths, and between sites.

Approach/ Statistical Design:

Progress: Sampling will be conducted along constant depth contours and at various depths. Where practical the sampling depths shall be 1, 3, 5, 10 meters, and 5 stations will be sampled at 200 m intervals to represent each depth. In no case will sampling be conducted more than 1 km from shore.

Tow sampling (eg. zooplankton, ichthyoplankton, etc.) will be conducted so as to be representative of the site (not at stations). In all cases five (5) replicate tows will be collected.

Parameters to be sampled:

Seven components of the environment will be sampled:

- (1) Benthos
- (2) Sediments
- (3) Epibenthos
- (4) Water
- (5) Neuston
- (6) Zooplankton
- (7) Fish

Sampling Sites:

The preferred 80-82 sampling sites lie along the Yukon coast from the Mackenzie Delta to Herschel Island. As possible alternates, sites have been chosen along Tuk Peninsula.

In each case, seven sites were identified with the understanding that one site would be sampled twice (total of 8) to assess seasonal variability.

This program will be initiated as soon as weather conditions and the acquisition of boat, safety and sampling equipment permit. It is not expected that the program will be underway before the middle of July. The program will extend as long as weather conditions permit, hopefully to the middle of September.

Reports: Interim report in 1982.

Time Frame: 3 to 4 years

Undertaken EPS NWT District Office

By: Research Personnel: Peter Wainwright
Steven Matthews

Funded by: Partial funding by Ocean Dumping Research Fund

Contact: Mr. Brian Wilson Telephone: 403-873-3456
Environmental Protection Service
Manager, Protection & Surveillance
Box 370
Yellowknife, NWT X1A 2N3

Project: MCKINLEY BAY, BEAUFORT SEA

Geographic Area: McKinley Bay, Beaufort Sea.

Objectives: The McKinley Bay program is intended to monitor the impact of the entire development activity in McKinley Bay.

Approach Progress: Emphasis is placed on sediments and benthos. The program will include a sufficient degree of replication to allow statistical comparison of stations.

Sediments: 5 samples of sediments will be collected at each of 10 stations with an Eckman grab.

Benthos: 5 samples of benthos will be collected at each station with an Eckman grab and sieved in the field.

Epibenthos: 5 epibenthos samples will be collected at five stations using a benthic sled with 243 u mesh.

Parameters to be analysed for will be the following:

- 1) Species identification
- 2) Biomass
- 3) Diversity (by calculation)
- 4) Bioaccumulation of Zn, Cd, Hg, Pb, Cu, Cr, Ni, As

Scheduling: Sediment samples will be collected at the beginning and end of the open water season only. Benthos and epibenthos will be collected monthly during open water, as practical.

Stations: While the total number of stations is fixed, they may be significantly relocated depending upon the results of the initial reconnaissance.

Reports: Reports will be produced when analytical work is completed.

Time Frame: Will begin this year and based on findings, may continue in the future.

Undertaken By: EPS NWT District Office

Research Personnel: Peter Wainwright
Mark Gordon
Steven Matthews

Contact: Mr. Brian Wilson Telephone: 403-873-3456
Manager, Protection & Surveillance
Environmental Protection Service
Box 370
Yellowknife, NWT X1A 2N3

Project: OCEAN DUMPING STANDARDIZATION

Geographic Area: Either Tuktoyaktuk Harbour or McKinley Bay

Objectives: The purpose of this program is to allow an analysis of variance to be performed with respect to (a) sampling device (including volume), (b) number of samples, and (c) pattern of sampling.

Approach · With respect to (b) number of samples, 10 samples will be
Progress: collected with each device. With respect to (c) pattern of sampling, only two patterns will be examined, transects and random sampling.

At present the number of sampling devices has not been determined. It is anticipated that there will be a maximum of 6.

Collected samples will be frozen on dry ice and subsequently analysed for mercury only. Samples may then be preserved for analysis at a late date for other parameters.

It is anticipated that this program will be run as a "parasite" to other programs (possibly at McKinley Bay). Accordingly it is not possible to identify sites etc. at this time. It is anticipated, however, that two sites will be sampled for comparative purposes: one representing an undisturbed location; and the other representing a dredge spoil deposition location.

Reports: Available when analysis completed, hopefully 1982.

Time Frame: This year only.

Undertaken EPS NWT District Office

By: Research Personnel: Mark Gordon
Peter Wainwright
Steven Matthews

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Manager, Protection & Surveillance
Environmental Protection Service
Box 370
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Project: MONITORING AND ASSESSMENT OF THE COMMERCIAL FISHERY POTENTIAL IN THE MACKENZIE DELTA.

Geographic Area: Mackenzie Delta/nearshore Beaufort Sea.

Objectives: To determine the population dynamics of major fish species in the Mackenzie Delta/Beaufort Sea area. To determine the present harvest of fish in the area. Based on the above, to assess the ability of the region to sustain exploitation.

Approach Progress: Contract for literature review of fisheries in the study area (nearing completion). Emphasis is being placed on Pacific herring. A preliminary visit to the area was made in 1980 to gain a better understanding of fisheries in the study area and to assess logistics and support facilities.

Detailed plans will be developed after the literature review is complete.

Reports: Literature review to be available summer of 81.

Time Frame: 1981-1985

Undertaken By: Agency: DFO, Western, Fisheries Resources Section, Winnipeg.
DFO Industrial Development Branch
Possibly COPE, Inuit Development Corporation

Research Personnel: A. Kristofferson

Funded by: Agency: N/A
Scientific Authority: N/A

Contact: Mr. A. Kirstofferson Telephone: 204-269-7379 ext. 281
Freshwater Institute
Department of Fisheries and Oceans, Western Region
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Project: MACKENZIE DELTA - BEAUFORT SEA PROJECT

Geographic Area: Nearshore Beaufort Sea - Mackenzie Delta.

Objectives: To obtain baseline information on fish resources, habitat sensitivity and utilization, sufficient to enable project staff to i) thoroughly review the environmental impact statements for proposed industrial developments through EARP; ii) to serve as expert witnesses at associated public hearings; iii) to develop resource sensitivity maps for the Beaufort Sea coast for use in oil spill contingency plans.

Approach Progress: Synoptic survey at coastal lagoons and respective freshwater systems, fish sampling in the Mackenzie Delta to document migration patterns; fish, shoreline, benthic, chemical and physical oceanographic investigations of Tuk Harbour. Monitoring for seasonal use of a "typical" coastal lagoon. Surveys of streams and lakes to determine fish composition and abundance and availability of overwintering and spawning habitat.

Reports: Lawrence et al. 1980. Mackenzie Delta Beaufort Sea project Interim Report.

Time Frame: 1978-1981.

Undertaken By: Agency: DFO Western, Fish Habitat Section, Resource Impact Division.

Research Personnel: M. Lawrence

Funded by: Agency: N/A
Scientific Authority: N/A

Contact: Mr. M. J. Lawrence Telephone: 204-269-7379 ext. 317
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Department of Fisheries and Oceans, Western Region
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Project: TUKTOYAKTUK LAKES STUDY

Geographic Area: Lakes in drainages flowing into Tuktoyaktuk Harbour.

Objectives: To undertake a study of three freshwater systems flowing into Tuktoyaktuk Harbour to determine the extent to which they are utilized as feeding, spawning, rearing and overwintering areas by anadromous coregonids or other fish species.

Approach
Progress: Sampling for fish will be carried out in the lakes and streams leading to them to determine the nature and timing of fish movements between the lakes and Tuktoyaktuk Harbour. Lake sampling will also include bathymetry, shoreline analysis, analytical chemistry and zoobenthos sampling.

Reports: N/A.

Time Frame: To be completed in 1983.

Undertaken By: Agency: DFO, Western, Fish Habitat Section, Resource Impact Div., Winnipeg.

Research Personnel: Mr. W. Bond

Funded by: Agency: N/A
Scientific Authority: N/A

Contact: Mr. W.A. Bond Telephone: 204-269-7379 ext. 170
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Department of Fisheries and Oceans, Western Region
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Project: SUBSISTENCE BELUGA/NARWHAL EXPLOITATION - MACKENZIE DELTA AND BAFFIN AREA.

Geographic Area: Mackenzie Delta and Cumberland Sound (beluga); Pond Inlet and Arctic Bay (narwhal).

Objectives: To obtain an up to date status of the annual subsistence hunt for beluga and narwhal in terms of levels of exploitation vs. sustained population in order to set realistic quotas which do not exceed sustainable yields.

Approach Not yet determined.
Progress:

Reports: N/A

Time Frame: Continuing

Undertaken By: Agency: DFO Western, Fisheries Resources Section, Winnipeg
Research Personnel: R.W. Moshenko

Funded by: Agency: N/A
Scientific Authority: N/A

Contact: Mr. R.W. Moshenko Telephone: 204-269-7379 ext. 287
Freshwater Institute
Department of Fisheries and Oceans, Western Region
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Project: ENERGY RELATED ORGANICS

Geographic Area: N/A

Objectives: To investigate the dynamics and effects of known compounds in the energy industry (e.g. components of Beaufort Sea crude oil) and will seek to find methods to analyze those compounds in real environmental samples.

Approach
Progress: Experimental exposures of embryo and larval fish will be carried out using a series of ¹⁴C-labelled oil compounds. Uptake and loss dynamics will be described at low temperatures and metabolic conversions will be described if products can be purified in sufficient quantities. Gross effects on fish and chironomid development will be documented. Which components of Beaufort oil are accumulated by organisms, and with what efficiencies, will be studied. The effects of selected oils on aquatic plants will be determined.

Reports: N/A

Time Frame: Continuing.

Undertaken By: Agency: DFO Western, Ecosystem Toxicology Section
Research Personnel: W.L. Lockhart.

Funded by: Agency: N/A
Scientific Authority: N/A

Contact: Dr. W.L. Lockhart Telephone: 204-269-7379 ext. 429
Freshwater Institute
Department of Fisheries and Oceans, Western Region
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Project: METALS IN ARCTIC ECOSYSTEMS

Geographic Area: Eastern Arctic

Objectives: To measure the concentrations of Pb, Hg, Se, Zn and Cd in liver, kidney, muscle and blubber of narwhal and to evaluate the results in relation to aquatic ecosystem states of varying degrees of pollution.

Approach Progress: Approximately 1200 analyses have been carried out and a report submitted to DIAND. Further samples will be obtained from a number of locations, hopefully also from the USSR and Greenland to broaden the data base and determine the normal concentrations and accumulation rates of metals in these animals.

Reports: A manuscript is in preparation for publication.

Time Frame: Continuing.

Undertaken By: Agency: DFO Western, Ecosystem Toxicology Section
Research Personnel: R. Wagemann

Funded by: Agency: DIAND
Scientific Authority:

Contact: Dr. R. Wagemann Telephone: 204-269-7379 ext. 267
Freshwater Institute
Department of Fisheries and Oceans, Western Region
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Project: HEAVY METAL AND HYDROCARBON MONITORING IN SEDIMENTS AND FISHES ALONG THE TUKTOYAKTUK PENINSULA.

Geographic Area: (Tentative) Canyonek Inlet to McKinley Bay.

Objectives: To obtain samples of sediments and fishes (Arctic flounder, starry flounder, fourhorn sculpins, and larval or under yearling pacific herring and ciscoes) from bays along the Tuktoyaktuk Peninsula. Samples obtained will be frozen and kept for analysis of hydrocarbons and heavy metals at some future date. In theory, such samples would provide a baseline with respect to existing concentrations of hydrocarbons and heavy metals to which analyses from future samples in the same localities could be compared to assess incremental changes in contaminant concentrations.

Approach See above.
Progress:

Reports: None. Progress report to be issued in the fall if study proceeds.

Time Frame: Biennial sampling would be conducted providing a laboratory and funds to conduct the analyses can be found.

Undertaken By: Agency: DFO Western, Fish Habitat Section, Resource Impact Division.

Research Personnel: B.W. Fallis, B. Mackenzie.

Funded by: Agency: N/A
Scientific Authority: N/A

Contact: B.W. Fallis Telephone: 204-269-7379 ext. 315
Freshwater Institute
Department of Fisheries and Oceans, Western Region
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Project: COASTAL MIGRATIONS: SPAWNING AREAS.

Geographic Area: Mackenzie Delta and lower Mackenzie River, N.W.T.

Objectives: The objective is to determine if any major spawning grounds for coastal populations of coregonids exist in the mainstream of the Mackenzie River by tracking and monitoring fish at key locations at the time of migration (Aug. - Sept.) and spawning (Oct. - Nov.).

Approach Progress: While the timing and major routes of migration of several coregonid species from the Beaufort Sea and Mackenzie Delta were established in previous studies (1971-74, 1978-80), their spawning areas remain unknown. In the first year of this study several areas in the delta near Aklavik and in the Mackenzie (near Arctic Red River), will be monitored regularly by a crew using a SITEX HONDA HE-106 Fish Finder to detect areas of concentrations or aggregations with time; the main channel bottom, where the flow has precluded most conventional gear, will receive particular attention. A second crew will sample fish at these same sites to verify fish finder information. The feasibility of radio or sonic tags for this study is being evaluated for the second year of the program.

Reports: None.

Time Frame: August 1981 to early November 1981.

Undertaken By: Agency: DFO Western, Fish Habitat Section, Resource Impact Division

Research Personnel: K. Chang-Kue.

Funded by: Agency: N/A
Scientific Authority: N/A

Contact: K.T.J. Chang-Kue Telephone: 204-269-7379 ext. 215
Freshwater Institute
Department of Fisheries and Oceans, Western Region
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Project: WATER QUALITY MONITORING IN TUKTOYAKTUK HARBOUR.

Geographic Area: Tuktoyaktuk Harbour.

Objectives: To determine whether or not development of Tuktoyaktuk Harbour (such as dredging and construction) is having any effect on water quality or stratification of water "layers" in the harbour.

Approach
Progress: Samples for temperature, salinity and a number of chemical parameters were taken in 1979 and 1980. Sampling is continuing.

Reports: Some results will be published in a report presently in preparation, probably in late 1981.

Time Frame: Continuing.

Undertaken By: Agency: DFO, Western Region, Fish Habitat Section, Resource Impact Division

Research Personnel: L. de March

Funded by: Agency: N/A
Scientific Authority: N/A

Contact: Mr. L. de March Telephone: 204-269-7379 ext. 341
Freshwater Institute
Dept. Fisheries and Oceans, Western Region
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Project: DATA INVENTORY OF BOWHEAD AND WHITE WHALES IN THE BEAUFORT SEA AND ADJACENT MARINE WATERS.

Geographic Area: Beaufort Sea.

Objectives: To assemble data on bowhead whales in the Beaufort Sea.
NOTE: A separate contract will be let to critically evaluate the data and identify data gaps.

Approach A contract is being let to a biological consulting firm which
Progress: will research literature and unpublished data sets.

Reports: None as yet.

Time Frame: 30 August 1981.

Undertaken Agency: probably LGL Ltd., Sidney, B.C.

By: Research Personnel: M. Fraker

Funded by: Agency: DFO-IOS, Pat Bay, B.C.; DFO, Western, FWI, Winnipeg, Man.

Scientific Authority: R. Englehardt, Offshore Assessment Group, DIAND, Ottawa, Ont.

Contact: Dr. A.B. Cornford Telephone: 604-656-8335
Oceanographic Information Division
Institute of Ocean Sciences
Patricia Bay, B.C.

- Project: REVIEW AND ASSESSMENT OF EXISTING DATA FOR FISH AND MARINE MAMMALS IN THE BEAUFORT SEA HYDROCARBON PRODUCTION AREA AND ALONG POSSIBLE TRANSPORTATION CORRIDORS.
- Geographic Area: Beaufort Sea, Beaufort seacoast fresh waters, Mackenzie drainage south to 60°N, Dempster Highway corridor, Northwest Passage east from the Beaufort and south to 60°N.
- Objectives: To assemble and evaluate a biological data base and to identify data gaps.
- Approach Progress: Contracts are being let for the following data compilations/appraisals:
- i) Ringed and bearded seal data for the Beaufort Sea.
 - ii) Pinniped data for Parry Channel, Baffin and Davis straits.
 - iii) Narwhal, bowhead and white whale data for Parry Channel, Baffin and Davis Straits.
 - iv) Invertebrate data for the Beaufort Sea.
 - v) Fish data for the Mackenzie drainage, Dempster Highway corridor and fresh waters of the Yukon and Tuktoyaktuk Peninsula (three separate contracts).
- Reports: None as yet.
- Time Frame: To be completed by 1 October 1981.
- Undertaken By: Agency: Contracts not yet let.
Research Personnel: Not yet known.
- Funded by: Agency: DFO, Western, IOS Pat Bay; and possibly EPS, DIAND and Industry.
Scientific Authority: i) A. Mansfield; ii) A. Mansfield; iii) A. Mansfield; iv) B. Smiley and E. Grainger; v) J. Stein, G. McKinnon and M. Lawrence respectively.
- Contact: Mr. L. de March Telephone: 204-269-7379 ext. 341
Freshwater Institute
Department of Fisheries and Oceans, Western Region
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Project: ONSHORE IMPACTS OF OFFSHORE HYDROCARBON DEVELOPMENT: AN ANNOTATED BIBLIOGRAPHY.

Objectives: To bring together in one place a set of comments on articles, reports etc. "... relating to the onshore impacts of offshore hydrocarbon development - and which may be of interest and use in the Canadian situation.

Approach
Progress: Attention was focused on publication which raise substantive issues regarding onshore impacts and which make specific recommendations.

Reports: Report to the Federal Activities Assessment Branch, Policy Planning and Assessment Directorate, Environment Canada - March 31, 1981. Onshore impacts of offshore hydrocarbon development: An annotated bibliography.

Funded by: Federal Activities Assessment Branch Policy Planning and Assessment Directorate, Environment Canada.

Contact: R. Baker Telephone: 819-997-1731
Federal Activities Assessment Branch
Environment Canada
351 St. Joseph Blvd.
Place Vincent Massey
Hull, Quebec K1A 1C4

Project: UPTAKE AND RETENTION OF PETROLEUM HYDROCARBONS IN TISSUE OF BENTHOS.

Geographic Area: Cape Hatt, Northern Baffin Island.

- Objectives:
- a) To quantify the short-term uptake and retention of petroleum hydrocarbons in benthic fauna during an in-situ exposure to crude oil and chemically dispensed crude oil, and to provide a baseline for a long-term assessment of petroleum hydrocarbon retention.
 - b) To determine the correlation between petroleum hydrocarbon concentration in tissues and short/long-term population and physiological effects measures as part of other biological studies.
 - c) To determine the correlation between petroleum hydrocarbon concentration in the tissue to the concentrations measured in the exposure media (water and sediment samples).

Approach
Progress: Biological samples will be collected in at least three sampling periods, including a pre-spill sample. Three standardized sampling sites will be chosen in each of three test bags (control, surface oil treated, dispersed oil treated). The largest number of samples will be analyzed for petroleum hydrocarbon residues by spectrofluorescence. Pooled samples representative of index species, sampling time, and dosing conditions will be assayed by capillary gas chromatography-mass spectrometry methods.

A total of eight species, representative of several trophic levels and feeding habits will be assessed. Hydrocarbon loading will be correlated with toxic responses to treatment, in particular changes in community structure, physiological condition indices, and pathological damage.

Reports: The project will form a Baffin Island Oil Spill (BIOS) Project Report, and will also lead to one or two reviewed research papers published in the primary environmental biology literature.

- Time Frame:
- a) Experimental Phase - July to September 1981, with a follow-up sample in July or August 1982.
 - b) Analytical Phase - 6 months following the experimental phase(s).
 - c) Reports - 1st report ready by March 1982.

Undertaken
By:

BIOS Project, Environmental Protection Service, Environment
Canada and Dept. of Indian Affairs and Northern Development.

Research Personnel: Dr. Rainer Engelhardt (project authority)
DIAND
Northern Environmental Protection
Offshore Environment Division
Ottawa

Energy Resources Company Inc.
Cambridge, Massachusetts.

Drs. Jerry Neff and Bob Hillman
Battelle New England Research Laboratory
Duxbury, Massachusetts.

Funded by: BIOS Project.

Contact: Dr. Rainer Engelhardt
DIAND
Northern Environmental Protection
Offshore Environment Division
Ottawa, Ontario K1A 0H4

Project: NEGOTIATION OF THE A) I.T.C. AND
B) DENE/METIS CLAIMS

Geographic Area: a) Eastern Arctic b) Mackenzie Valley

Objectives: Settlement of native land claims.

Approach The I.T.C. claim is under negotiation and the Dene/Métis
Progress: claim is anticipated to start in August of 1981.

Reports: Occasional information bulletins and annual departmental report.

Time Frame: Two years to final agreement.

Undertaken Office of Native Claims, N.W.T. and Labrador Group, DIAND.
By:

Contact: K.J. Crowe Telephone: 810-994-1174
Office of Native Claims, N.W.T. and Labrador Group
DIAND
Ottawa, Ontario K1A 0H4

Project: NORTHERN LAND USE INFORMATION SERIES MAPPING PROJECT

Geographic Area: Viscount Melville Sound Region

Objectives: To provide convenient reconnaissance land information base to facilitate regional planning and the application of the territorial land use regulations.

Approach Progress: Reconnaissance level information base including: wildlife, fish resources, native land use, ecological land classification, socio-economic and cultural data.

Undertaken By: Dept. of Indian and Northern Affairs and Environment Canada, Lands Directorate.

Co-ordinator: G. McLean
Lands Directorate
Environment Canada.

Contact: A. Patric
Land Management Division
Northern Environment Branch, DIAND
Ottawa, Ontario K1A 0H4

G. McLean
Lands Directorate
Environment Canada
Ottawa, Ontario
K1A 0E7

Project: HISTORICAL DEVELOPMENT OF CURRENT PATTERNS OF INUIT CULTURE AND IMPLICATIONS WITH RESPECT TO FUTURE DEVELOPMENT.

Geographic Area: Baffin Island

Objectives: To gain insight into how Inuit culture has changed this century, and how it will further have to change if Inuit participate in the wage economy.

Approach
Progress: Historical research from anthropological/sociological perspective.

Time Frame: December 1980

Undertaken By: McGill University, Centre for Northern Studies and Research

Contact: G. Leitch Telephone: 403-232-8000
Community Liaison and Social Impact Assessment
Petro-Canada
P.O. Box 2844
Calgary, Alberta
T2P 2M7

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns. Vol. IV, Part 1, 1980-81, (Card No. 1569) In preparation.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: BOWHEAD WHALE DISTRIBUTION AND MOVEMENT STUDY

Geographic Area: Toker Point, Cape Bathurst, Northwest Territories.

Objectives: To document the number, distribution and movements of bowhead whales within the prescribed area.

Approach Progress: Aerial surveys with Twin Otter and Islander aircraft will be used.

Time Frame: August 1980 - September 1980.

Undertaken By: LGL Ltd.

Funded by: Industry.

Contact: Rolph A. Davis
LGL Ltd.
Environmental Research Associates
44 Eglinton Avenue West
Toronto, Ontario
M4R 1A1

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns, Vol. IV, Part 1, 1980-81, (Card No. 1624).
In preparation.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: ARCTIC SEAS STUDY

Geographic Area: Northwest Passage.

Objectives: To review the existing body of knowledge about the High Arctic; to assess Canadian science policy in the North; to identify the implications of aboriginal rights on resource development; to review regulatory processes applicable to northern resource transportation projects; to evaluate options for the development and transportation projects; to evaluate options for the development and transportation of non-renewable resources; to monitor international development.

Approach
Progress: Several studies have been commissioned under the project umbrella to meet the objectives above. In order to focus public attention on the issues raised by arctic marine transportation, the project has published a monthly bulletin, 2 reports, and organized a conference.

Reports: Marine Transportation and High Arctic Development: Policy Framework and priorities. Canadian Arctic Resources Committee 1979.

Time Frame: September 1978 - Spring 1981.

Undertaken By: Canadian Arctic Resources Committee

Funded by: Research Co-ordinator: François Bregha, Canadian Arctic Resources Committee
Researcher(s): Robbie Keith and Randy Ames

Contact: François Bregha Telephone: 613-236-7379
Canadian Arctic Resources Committee
46 Elgin Street, Room 11
Ottawa, Ontario
K1P 5K6

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns. Vol. IV, Part 1, 1980-81, (Card No. 1470) In preparation

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: BOWHEAD WHALE BEHAVIOUR

Geographic Area: Cape Perry, Northwest Territories.

Objectives: There are four basic objectives:

- a) To document the normal behaviour patterns of the bowhead whale;
- b) Determine type and quantity of responses if any, of bowheads to boats and aircraft passing at various distances;
- c) Determine the type and quantity of responses if any, of bowheads to underwater playbacks of recorded industrial noises;
- d) Determine and compare the physical characteristics of water and zooplankton abundance in feeding and non-feeding areas.

Time Frame: July 1980 - September 1980

Undertaken By: LGL Ltd.

Funded by: United States Government

Contact: W. John Richardson
Vice-President, Research
LGL Ltd.
Suite 414, 44 Eglinton Avenue West
Toronto, Ontario.

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns. Vol. IV, Part 1, 1980-81, (Card No. 1625).
In preparation.

Preliminary Communication:

G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: NORTHERN SHORE ZONE MANAGEMENT (II)

Geographic Area: North Slope Burrough, Alaska.

Objectives: To investigate, review and assess the North Slope Burrough's attempt to plan and manage their ocean shore zone in the Beaufort Sea Region.

Approach
Progress:

1. Describe planning relating to: a) development of offshore energy resources, b) transportation and harbor development c) changing land ownership patterns
2. Describe how local and native groups have been integrated into planning process
3. Describe expected changes in permitting processes to accommodate plan.

Reports: Northern Shore Zone Management, by Norman Dale, March 1979.

Time Frame: August 1980 - March 1981.

Undertaken Norman Dale

By: Research Co-ordinator: Ronald D. Bailey,
Water Mangement Section
Dept. of Indian and Northern Affairs

Funded by: Federal Government.

Contact: Ronald D. Bailey Telephone: 819-997-0559
Water Management Section
Department of Indian and Northern Affairs
Les Terrasses de la Chaudière
Ottawa, Ontario
K1A 0H4

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns. Vol. IV, Part 1, 1980-81, (Card No. 1662).
In preparation.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: LEGAL ASPECTS OF MARITIME TRANSIT IN THE ARCTIC

Geographic Area: Northern Canada

Objectives: To investigate the environmental implications of marine transit in the Arctic to determine whether existing laws are adequate and whether Canada has the jurisdiction under international law to regulate marine transit in the appropriate manner.

Approach
Progress: Survey of literature on environmental effects of marine transit in the Arctic, analysis of international and domestic laws and interview with government and industry officials.

Time Frame: 1980 - December 1981.

Undertaken
By: University of British Columbia, Faculty of Law

Contact: D.M. McRae or John Goundrey Telephone: 604-228-3403
Faculty of Law
University of British Columbia
Vancouver, British Columbia

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns. Vol. IV, Part 1, 1980-81, (Card No 1676) In preparation.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: EFFECTS OF SPILLED CRUDE OIL ON MICROORGANISMS

Geographic Area: Bent Horn Area, Cameron Island and Truelove Lowland, Devon Island.

Objectives: To continue a long term study of the effects of spilled crude oil on microorganisms. Soil samples will be taken and test plots of oil spilled in previous years will be monitored.

Time Frame: On-going.

Undertaken By: Concordia University, Department of Biology.
Research Co-ordinator: Paul Widden
Researcher(s): Paul Widden, M. Goguen and C. Ferguson

Contact: Paul Widden
Department of Biology
Concordia University
Loyola Campus
7141 Sherbrooke St. W.
Montreal, Quebec H4B 1R6

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns. Vol. IV (Card No. 1648) In preparation.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: ECOLOGY OF THE CANADIAN ARCTIC ARCHIPELAGO: SELECTED REFERENCES. VOLUME 9.

Geographic Area: Canadian Arctic Archipelago

Objectives: To provide a selected bibliography with detailed annotations of current literature relating to the ecology (terrestrial, freshwater and marine) of the Canadian Arctic Archipelago and to provide indexes to this information by subject and geographic categories and by geographic co-ordinates.

Reports: Vols. 1-8, Ecology of the Canadian Arctic Archipelago: Selected references, are available from Dr. D.M. Barnett.

Time Frame: May 1980 - April 1981.

Undertaken By: Western Ecological Services, Sydney, British Columbia.
Research Co-ordinator: D.M. Barnett, A/Chief
Environmental Studies Division
Dept. of Indian & Northern Affairs
Researcher(s): N. Merle Peterson, Western Ecological Services

Contact: D.M. Barnett, A/Chief Telephone: 819-997-0044
Environmental Studies Division
Northern Environmental Protection Branch
Northern Affairs Program
Department of Indian and Northern Affairs
Les Terrasses de la Chaudière
Ottawa, Ontario

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns. Vol. IV (Card No. 1653) In preparation.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: BIOLOGICAL CHANGES RESULTING FROM DRILLING FLUID DISPOSAL IN THE CANADIAN ARCTIC.

Geographic Area: Arctic Island and Mackenzie Delta, Northwest Territories, Yukon Territory.

Objectives: To study the disposal of drilling fluids in order to enable the Department to set standards for disposal by various methods. The project examines residual toxicity of plants and soil at sites, where various disposal methods have been used.

Reports: Biological Changes in Permafrost Terrain Adjacent to High Arctic Oil and Gas Well Sites, Department of Indian and Northern Affairs, Environmental Studies No. 16.

Time Frame: April 1977 - March 1982.

Undertaken By: University of Guelph
Research Co-ordinator: D.M. Barnett, A/Chief
Environmental Studies Division
Dept. of Indian & Northern Affairs
Researcher(s): D.W. Smith, University of Guelph

Contact: D.M. Barnett, A/Chief Telephone: 819-997-0044
Environmental Studies Division
Northern Environmental Protection Branch
Northern Affairs Program
Department of Indian and Northern Affairs
Les Terrasses de la Chaudière
Ottawa, Ontario

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns, Vol. IV (Card No. 1577). 1980.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: POST OIL SPILL RECOVERY OF ARCTIC VEGETATION

Geographic Area: Norman Wells, Tuktoyaktuk, Cape Parry, Northwest Territories

Objectives: To briefly revisit sites and record changes.

Approach
Progress: Detailed recording at plots.

Time Frame: 1972 - Spring 1981 with possible reactivation in 1984 or 1985

Undertaken
By: University of Toronto, Department of Botany
Research Co-ordinator: D.M. Barnett, Department of Indian and Northern Affairs
Research(s): T.C. Hutchinson, University of Toronto

Contact: T.C. Hutchinson or Dr. D.M. Barnett
Department of Botany A/Chief, Environmental Studies
University of Toronto Division
Toronto, Ontario Northern Environmental
Protection Branch
tel: 416-978-3537 Northern Affairs Program
Depart. Indian & Northern Aff.
Les Terrasses de la Chaudière
Ottawa, Ontario
tel: 819-997-0044

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns. Vol. IV (Card No. 1576). In preparation.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: TERRAIN-VEHICLE INTERACTION - KEEWATIN

Geographic Area: District of Keewatin

Objectives: a) To gather data enabling sound decisions to be made on
i) Summer vehicle use Yes/No
ii) If yes, appropriate restrictions
b) To facilitate Communication with industry to ensure mutual understanding of objectives.

Approach Progress: Data gathering during test periods and in locally defined test areas, and subsequent analysis.

Reports: Terrain Disturbance from Vehicle Movement, Lone Gull Lake, Central Keewatin. Geological Survey of Canada: Current Research Pt. B Paper 80-1B p. 69-74 1980.

Time Frame: April 1980 - March 1982

Undertaken By: Energy, Mines and Resources, Geological Survey of Canada
Research Co-ordinator: D.M. Barnett, Department of Indian and Northern Affairs
Researcher(s): L.D. Dyke

Contact: L.D. Dyke or D.M. Barnett
Geological Survey of Canada A/Chief Environmental Studies
601 Booth Street Division
Ottawa, Ontario Northern Environmental
tel: 613-593-6058 Protection Branch
Depart. Indian & Northern Aff.
Les Terrasses de la Chaudière
Ottawa, Ontario
tel: 819-997-0044

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns. Vol. IV (Card No. 1575). In preparation.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: TEMPERATURE EFFECTS OF CRUDE OIL ON POLAR BEARS

Geographic Area: Northern Canada

Objectives: To examine, the immediate and long term effects of oil on polar bear by studying:
1) the bear's ability to regulate its body temperature after the hair becomes fouled with oil
2) the thermal properties of oiled polar bear fur from hides of bear (not in site)

Reports: Temperature Effects on oil on Polar Bears, by N.A. Øritsland, R. Hurst and P.D. Watts, September 1980.

Time Frame: March 1979 - September 1980

Undertaken By: University of Oslo

Research Co-ordinator: Camille Mageau, Department of Indian and Northern Affairs
Researcher(s): Nils A. Øritsland, University of Oslo

Contact: Camille Mageau Telephone: 819-997-0044
Offshore Environment Division
Northern Environmental Protection Branch
Department of Indian and Northern Affairs
Les Terrasses de la Chaudière
Ottawa, Ontario K1A 0H4

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns. Vol. IV (Card No. 1551) In preparation.

Preliminary Communication:

G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: BOWHEAD WHALE SIGHTINGS IN THE CENTRAL AND EASTERN CANADIAN ARCTIC

Geographic Area: Central and Eastern Canadian Arctic

Objectives: To prepare a detailed table, map and text delineating the distribution and sources of bowhead whale sightings in the Central and Eastern Canadian Arctic from that period represented by the Nesheim cards and other sources.

Reports: Migration of Bowhead Whale in the Eastern Canadian Arctic, by Michèle McLaughlin, March 31, 1980.

Time Frame: April 1979 - March 1980

Undertaken By: Michèle McLaughlin
Research Co-ordinator: Camille Mageau, Department of Indian and Northern Affairs
Researcher(s): Michèle McLaughlin

Funded by: Federal Government

Contact: Camille Mageau Telephone: 819-997-0044
Offshore Environment Division
Northern Environmental Protection Branch
Department of Indian and Northern Affairs
Les Terrasses de la Chaudière
Ottawa, Ontario
K1A 0H4

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns, Vol. IV (Card No 1552) In preparation.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: HAEMATOLOGICAL AND PETROLEUM RESIDUE STUDIES OF EXPERIMENTAL POLAR BEARS

Geographic Area: Canada

Objectives: To monitor polar bears during confinement, and perform haematological and petroleum residue studies in order to assess the impact of oil pollution in those animals.

Reports: Oil Pollution in Polar Bears: Exposure and Clinical Effects, September 1980.

Time Frame: March 1980 - January 1980.

Undertaken By: R.F. Engelhardt
Research Co-ordinator: Camille Mageau, Department of Indian and Northern Affairs
Researcher(s): R.F. Engelhardt

Funded by: Federal Government

Contact: Camille Mageau Telephone: 819-997-0044
Offshore Environment Division
Northern Environmental Protection Branch
Department of Indian and Northern Affairs
Les Terrasses de la Chaudière
Ottawa, Ontario
K1A 0H4

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns, Vol. IV (Card No. 1555) In preparation.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. of Indian Affairs and Northern Development.

Project: BIOS-BAFFIN ISLAND OIL SPILL

Geographic Area: Cape Hatt, Bylor Island, Northern Eastern Arctic

Objectives: To determine if the use of dispersants in the Arctic nearshore will reduce or increase the environmental effects of spilled oil, and to assess the relative effectiveness and environmental impact of other shoreline protection and cleanup techniques.

To determine the physical and chemical behaviour and fate of chemically treated and untreated oil and its biological effects in the Arctic nearshore.

Time Frame: April 1980 - Summer 1984.

Undertaken By: Canadian Departments of Environment, Fisheries and Oceans, and Indian and Northern Affairs, Canadian Oil Industry, Norwegian and United States Government.
Research Co-ordinator: Peter Blackall
Environmental Protection Service.

Funded by: Canadian Departments of Environment, Fisheries and Oceans, and Indian and Northern Affairs, Canadian Oil Industry, Norwegian and United States Government.

Contact: Camille Mageau Telephone: 819-997-0044
Offshore Environment Division
Northern Environmental Protection Branch
Department of Indian and Northern Affairs
Les Terrasses de la Chaudière
Ottawa, Ontario
K1A 0H4

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns, Vol. IV (Card No. 1556) In preparation.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: HISTOPATHOLOGY AND HAEMATOLOGY OF EXPERIMENTAL POLAR BEARS.

Geographic Area: Canada

Objectives: To assess the pathological changes and their interpretation in relation to clinical pathological alterations induced by the crude oil used in the experiment.

Approach To perform autopsies and histopathological analysis of two
Progress: dead bears and haematology monitoring of the third live bear.

Reports: Crude Oil Related Pathology in Polar Bears, by F.A. Juck, September 1980.

Time Frame: March 1980 - September 1980.

Undertaken F.A. Juck
By: Research Co-ordinator: C. Mageau, Department of Indian and Northern Affairs
Researcher(s): F.A. Juck

Funded by: Federal Government.

Contact: Camille Mageau Telephone: 819-997-0044
Offshore Environment Division
Northern Environmental Protection Branch
Department of Indian Affairs and Northern Development
Les Terrasses de la Chaudière
Ottawa, Ontario
K1A 0H4

Reference: Current and Recent Research and Studies Relating to Northern Social Concerns, Vol. IV (Card No. 1557) In preparation.

Preliminary Communication:
G. Rosenberg, Northern Research Information and Documentation Service, Northern Affairs Program, Dept. Indian Affairs and Northern Development.

Project: ECOLOGICAL BASIS FOR ENVIRONMENTAL IMPACT ASSESSMENT IN CANADA

Objectives: To develop comprehensive recommendations whereby the principles of ecological theory can be applied to the preparation of environmental impact studies and related activities.

1. To determine the extent to which ecological principles and techniques have been applied to environmental impact assessments in Canada and document areas where such applications would have significantly improved the quality of impact statements.
2. To provide guidance on the application of ecological principles and techniques in the formulation of impact assessment objectives, adoption of study designs, the collection and analysis of data and the interpretation of such data for the purposes of assessing and evaluating environmental impacts.
3. To make specific recommendations regarding the application of the above guidelines in related programs and activities including environmental baseline studies and post-project monitoring requirements.
4. To evaluate the potential for incorporating such guidelines within a legal framework related to impact assessment procedures.

Approach
Progress: Reviews of "state-of-the-act" in environmental impact assessment work, analysis of actual environmental impact statements, and interviews with key scientists to be used as discussion points at a series of technical workshops to be held across the country.

Time Frame: 1980 - ongoing.

Undertaken
By: Institute for Resource and Environmental Studies Dalhousie University.
Principal Investigator: G. Beanlands

Funded by: Dalhousie University, the Federal Environmental Assessment Review Office, and Environment Canada.

Contact: G. Beanlands Telephone: 902-424-3632
Institute for Resource
and Environmental Studies
1312 Robie Street
Halifax, Nova Scotia
B3H 3E2

Project: APPLICABILITY OF SCOTTISH SHORE EXPERIENCE TO CANADIAN
BEAUFORT SEA DEVELOPMENT.

Objectives: (1) To make recommendations for improved shorezone management
in the Beaufort Sea area on the basis of experience in
Scotland, including the Shetland Islands.
(2) To improve social and environmental decision making and
management of the Beaufort Sea.

Time Frame: June 1980 - March 1981.

Undertaken Faculty of Environmental Studies, University of Waterloo
By: Principal Researchers: J.G. Nelson and Sabine Jessen.

Funded by: Department of the Environment and Department of Indian and
Northern Affairs.

Contact: Dr. J.G. Nelson
Faculty of Environmental Studies
University of Waterloo, ES2
Waterloo, Ontario
N2L 3G1

Project: ENVIRONMENTAL ASSESSMENT PANEL PROJECTS.

Objectives: The purpose of the Federal Environmental Assessment and Review Process is to ensure that the environmental effects of federal projects, programs and activities are assessed early in their planning. Activities with potentially significant environmental effects are submitted to the Minister of the Environment for formal review by an Environmental Assessment Process. Based on recommendations to the Minister resulting from this review, decisions can be made as to how the project should proceed or if it should proceed at all.

Approach
Progress: The formal review process includes such stages as the formation of an Environmental Assessment Panel; the formulation of guidelines for the preparation of an Environmental Impact Statement (EIS); the preparation of the EIS by or on behalf of the initiator; technical and scientific reviews of the EIS by federal and/or provincial agencies; implementation of an extensive public information program; holding of public meetings in the area affected by the project to allow interested parties to present their opinions; and finally, preparation of a report by the Environmental Assessment Review Panel outlining its recommendations. The final decision rests with the Minister of the Environment, the Minister of the initiating department, and other Cabinet members.

Projects
and
Contacts: TABLE OF CURRENT/RECENTLY COMPLETED PANEL PROJECTS (NORTH OF 60°): - (For more complete information, see "Register of Panel Projects, Number 16, Sept. 1981. FEARO).

PROJECT 1: BEAUFORT SEA HYDROCARBON DEVELOPMENT.

Proponents: Dome Petroleum Limited, ESSO Resources Canada Ltd, Gulf Canada Resources Ltd.

Initiator: Department of Indian and Northern Affairs (DINA)

Contact: Dr. O. Løken, DINA, Les Terrasses de la Chaudière, Hull, Que.
Mailing address: DINA, Ottawa, K1A 0H4

Description: Possible oil and gas production from the Beaufort Sea and subsequent transportation to southern markets via ice-breaker tanker through the Northwest Passage and/or an overland pipeline route. The proposal under review is still at the preliminary design stage with project specific details such as location of development fields, development methods, tanker

Cont: TABLE OF PROJECTS
Environmental Assessment Panel Projects

routes and tanker design, pipeline routes and details of ancillary and support facilities yet to be decided upon.

Status The project was referred for a Panel review on July 22, 1980.
under EARP: Panel members are:
J.S. Tener, Chairman, Ottawa, Ontario
F.J. Carmichael, Inuvik, N.W.T.
D.R. Craig, Carbon, Alberta
L. Ivvalu, Igloolik, N.W.T.
A. Lueck, Whitehorse, Y.T.
J.R. Mackay, Vancouver, B.C.
M. Stutter, Dawson, Y.T.

Executive Secretary to the Panel:
D.W.I. Marshall, 700-789 West Pender Street, Vancouver, B.C.
V6C 1H2 (604-666-2431)

The Panel circulated draft EIS guidelines to the public in June, 1981, requesting written comments by September 7, 1981. Requests have been made by the Panel to various departments and agencies for a departmental impact statement by the end of 1981. The Minister provided the Panel with terms of reference in June, 1981.

Future The Panel plans to hold public meetings on the draft EIS
Events: guidelines in the near future. Dates and location for the meetings shall be announced in the near future.

PROJECT 2: NORMAN WELLS OIL FIELD DEVELOPMENT AND PIPELINE

Geographic Norman Wells, Northwest Territories and the Mackenzie River
Area: Valley south to the Alberta border.

Proponents: Esso Resources Limited and Interprovincial Pipelines Limited

Initiator: Department of Indian and Northern Affairs
Contact: W.D. Mills, Northern Pipeline Branch, Department of
Indian and Northern Affairs, Les Terrasses de la
Chaudière, Hull, Quebec
Mailing address: Ottawa, Ontario K1A 0H4

Description: The proposed project includes development of the present Norman Wells oilfield and pipeline construction and operation over a right-of-way enroute to the Zama Lake area in Alberta. A 12-inch diameter oil pipeline is planned.

Cont: TABLE OF PROJECTS
Environmental Assessment Panel Projects

Status The Panel was formed in May 1980.
under EARP: Executive Secretary to the Panel: R.L. Greyell
Federal Environmental
Assessment Review Office
Ottawa, Ontario
K1A 0H3
(819) 997-1000

Panel report was submitted to the Minister of the Environment,
January 1981.

PROJECT 3: EASTERN ARCTIC OFFSHORE DRILLING - NORTH DAVIS STRAIT PROJECT

Initiator: Department of Indian and Northern Affairs

Contact: A. Jones, DINA, Les Terrasses de la Chaudière, Hull, Que.,
Mailing address: DINA, Ottawa, Ontario K1A 0H4

Proponent: Petro-Canada

Contact: Gerry Glazier, P.O. Box 2844, Calgary, Alberta T2P 2M7

Description: Exploratory drilling for hydrocarbons in the waters off the
north-eastern coast of Baffin Island in the Eastern Arctic.

Status The project was referred for Panel review in July, 1977. A
under EARP: task force has developed guidelines for the preparation of an
Environmental Impact Statement. The Environmental Impact
Statement is presently being prepared.

Panel members are:

R.G. Connelly, Chairman, Federal Environmental Assessment
Review Office, Hull, Quebec.

E.J. Sandeman, Department of Fisheries and Oceans, St. John's,
Newfoundland

Executive Secretary to the Panel: R.L. Greyell, FEARO, Hull,
Quebec K1A 0H3 (819) 997-1000

Cont: TABLE OF PROJECTS
Environmental Assessment Panel Projects

PROJECT 4: ALASKA HIGHWAY GAS PIPELINE.

Proponent: Foothills Pipe Lines (South Yukon) Ltd.

Contact: 1600 - 205, 5th Avenue S.W., Box 9083, Calgary, Alberta
T2P 2W4

Initiator: Northern Pipeline Agency

Contact: Mr. A.B. Yates, Deputy Administrator, 400 - 4th Avenue S.W.,
Calgary, Alberta.

Description: Construction and operation of a buried gas transmission line in the Southern sector of the Yukon Territory, to initially transport Alaska gas to U.S. markets in the lower 48 states. The proposed Yukon section of the line runs from Beaver Creek in the western corner of the Yukon, along the existing Alaska Highway for 512 miles to Watson Lake in the southeast Yukon. At its northern end the pipeline is proposed to connect to 732 miles of pipeline in Alaska, and at its southern end to 1500 miles of proposed line in British Columbia, Alberta and Saskatchewan. The system will tie in at the 49th parallel with the U.S. system. The projected cost of the Beaver Creek to Watson Lake line is \$1.24 billion (1976 dollars).

Status under EARP: The project was referred for formal Panel review in March 1977, and the Panel was formed in May, 1977.

Executive Secretary to the Panel:
P.J.B. Duffy, FEARO, Hull, Quebec K1A 0H3 (819) 997-1000

Reports were submitted to the Minister of the Environment:
Alaska Highway Gas Pipeline project, Yukon Territory. Interim report to the Minister, Aug. 1, 1977.

Alaska Highway Gas Pipeline Project, Yukon Public Hearings
(March - April 1979) Report to the Minister, August 1979.

Alaska Highway Gas Pipeline project, Yukon Territory. Routing Alternatives, Whitehorse/Ibex Region. Report to the Minister, July 1981.

Cont: TABLE OF PROJECTS
Environmental Assessment Panel Projects

PROJECT 5: ARCTIC PILOT PROJECT (NORTHERN COMPONENT)

Geographic Area: Melville Island and waters of Barrow Strait, Lancaster Sound, Davis Strait and an Eastern Canada Port.

Initiator: Department of Indian and Northern Affairs
Contact: W. Mills, DINA, Les Terrasses de la Chaudière, Hull, Quebec
Mailing address: DINA, Ottawa, K1A 0H4
Petro-Canada (for contact see Proponent)

Proponent: Petro-Canada
Contact: Menno Homan, P.O. Box 2844, Calgary, Alberta
T2P 2M7

Description: Involved in this project would be the construction of a small number of wells in the Drake Point area of Melville Island, a small gas plant, a pipeline to carry natural gas from the Drake Point area to Bridport Inlet on Southern Melville Island, a liquid natural gas plant to process 250 million cubic feet per day of gas, a harbor facility at Bridport Inlet capable of year around operation, and two icebreaking LNG carriers designed to operate between Bridport Inlet and an east coast port on a year round basis.

Status Under EARP: Executive Secretary to the Panel: R.G. Connelly, FEARO
Ottawa, Ontario K1A 0H3
(819) 997-1000

The Panel submitted its report to the Minister of the Environment, October 1980.

PROJECT 6: DEMPSTER PIPELINE PROJECT (DORMANT)

Proponent: Foothills Pipe Lines (Yukon) Limited.

Contact: 1600 - 205, 5th Avenue, S.W., Box 9083, Calgary, Alberta
T2P 2W4

Initiator: Department of Indian and Northern Affairs

Contact: O. Loken, DINA, Les Terrasses de la Chaudière, Hull, Quebec
Mailing Address: DINA, Ottawa, Ontario K1A 0H4

Cont: TABLE OF PROJECTS
Environmental Assessment Panel Projects

Description: Construction and Operation of a gas pipeline for transmission of Mackenzie Delta Gas in the Northwest Territories to a point at or near Whitehorse in the Yukon Territory to link up with the projected Alaska Highway Gas Pipeline. The route will follow closely the Dempster Highway and the Klondike Highway.

For information:

R.L. Greyell, FEARO, Hull, Quebec K1A 0H3
(819) 997-1000

PROJECT 7: MACKENZIE DELTA GAS GATHERING SYSTEM (DORMANT)

Proponents: Imperial Oil, Gulf Oil and Shell Oil

Initiator: Department of Indian and Northern Affairs

Contact: Dr. O. Loken, DINA, Les Terrasses de la Chaudière, Hull, Que.

Description: Construction and operation in the Mackenzie River Delta Region (N.W.T.) of three gas processing plants and transportation facilities by the above oil companies to supply a Dempster pipeline moving gas south to market in southern Canada. In the summer of 1977 these three projects were suspended. However, an Environmental Impact Statement for the Imperial Oil plant (Taglu) has been prepared for review. The estimated cost of the Taglu development (Imperial Oil) is \$500 million (1975 dollars).

For information:

R.L. Greyell, FEARO, Hull, Quebec K1A 0H3
(819) 997-1000

PROJECT 8: POLAR GAS PROJECT (DORMANT)

Proponents: Polar Gas, Consortium and Panarctic Gas Ltd.

Contact: J. Riddick, Polar Gas Project, P.O. Box 80, Commerce Court West, Toronto, Ontario M5L 1H3

Co- Department of Indian and Northern Affairs (N.W.T. portion)

Initiators:

Contact: A Jones, DINA, Les Terrasses de la Chaudière, Hull, Quebec

Cont: TABLE OF PROJECTS
Environmental Assessment Panel Projects

Department of Energy, Mines and Resources (area south of 60th parallel).

H.C. Rothschild, Science and Technology, EMR, 580 Booth St.,
Ottawa, Ontario K1A 0E4

Description: The project includes extraction and purification of gas from fields in the High Arctic Islands, and construction of a large diameter pipeline for natural gas transmission through the Northwest Territories and one or more provinces to a junction with an existing pipeline in southern Canada.

For information:

R.G. Connelly, FEARO, Hull, Quebec K1A 0H3
(819) 997-1000

PROJECT 9: SOUTH YUKON TRANSPORTATION STUDY (DORMANT)

Initiator: Federal Department of Transport

Contact: D.W. Bachynski, Railway Transportation Directorate, Transport Canada, 2760-200 Granville Street, Vancouver, B.C. V6C 1S4

Description: The study includes consideration of alternatives within the Yukon Territory principally between Whitehorse and Ross River with possible links to British Columbia, Alaska or the Northwest Territories. Improvement of transportation systems in the Yukon involving the study of several alternate railway and one road development strategies. The ultimate purpose of the project is to aid in the development of the natural resource potential of the Yukon. The alternate range in capital costs from \$35 million to \$370 million (1974 dollars).

For information:

P. Scott, FEARO, 700-789 West Pender St., Vancouver, B.C.
V6C 1H2 (604) 666-2431

Project: ICE BEHAVIOUR - C-CORE
(Centre for Cold Ocean Resources Engineering)

Contact: David Bazeley Telephone: 709-737-8354
C-CORE (Centre for Cold Ocean Resources Engineering)
Captain Robert A. Bartlett Bldg.
Memorial University of Newfoundland
St. John's, Newfoundland A1B 3X5

PROJECTS: TABLE OF PROJECTS INFORMATION

Project: I.1 CHARACTERIZATION OF PACK ICE COVER

Scope: A C-CORE team was aboard the CCGS Franklin when she entered Lake Melville to support the M.V. Arctic Probe in February 1981. This voyage permitted a set of observations of the types of ice cover encountered on the passage with a series of oblique photographs. This material is to be worked into floe size distributions for the passage.

Program Link: This description will be added to the available data base of ice types encountered by transiting ships in Labrador waters.

Timing: 1981

Team: Bill Winsor Group Leader, Wolfgang Thomier, Eugene Guy

Status: The overlay grids to scale the floe sizes from the oblique photographs has been completed.
The field work was done in late February 1981.

Project: SEABED GROUP - C-CORE
(Centre for Cold Ocean Resources Engineering)

Contact: David Bazeley Telephone: 709-737-8354
C-CORE (Centre for Cold Ocean Resources Engineering)
Captain Robert A. Bartlett Bldg.
Memorial University of Newfoundland
St. John's, Newfoundland A1B 3X5

PROJECTS: TABLE OF PROJECT INFORMATION

Project: S1.1 REGIONAL SCOUR DATA BANK

Scope: This is to form the collaborative data bank of the Iceberg Scour Working Group, made-up of industrial and government members. It is intended to catalog and provide storage for all the collected materials relating to iceberg scouring field programs and surveys that are publicly available. The physical materials will be kept at the Atlantic Geoscience Centre at Dartmouth, N.S.

Program Link: This is an organizational feature which will serve to ensure that all the costly data materials are properly sorted, annotated and available to everyone in the community when a need arises.

Timing: 1979 through 1984

Team: Vaughn Barrie Group Leader, Mike Lewis

Status: This is an ongoing task and the various data components are to be entered as soon as they are correctly annotated, cataloged and no longer in current use for each project.

Project: S1.2 THE DATING AND FREQUENCY OF ICEBERG SCOURS

Scope: There are presently five techniques under evaluation to provide an estimate of the age of scours and to attempt to establish the frequency of occurrence of a scouring event. The techniques are; detailed scour analysis, repetitive mapping at specific sites, sedimentary analysis for rate of erasure, relative ages from cross-cutting and identification of observed scouring events recorded with the wellsite observations of iceberg tracks.

Program Link: The engineering focus of this portion of the program is to establish an estimate of the expected frequency of iceberg scours for a site based on latitude, bathymetry, oceanography and ice environment.

Timing: 1979 through 1984

Team: Vaughn Barrie Group Leader, Chris Lynas, Bill Collins, Tony Randall, Chris Pereira.

Status: There was a five day cruise on the CSS Baffin in May '81 for field-work on the Hibernia site.
The raw data for the cross-cutting project and wellsite drift track data is being entered onto magnetic disk storage and grounding iceberg identified. Northern cruises are planned for October and November.

Project: S1.3 MECHANISM OF ICE SCOURING

Scope: The assembling of the various field observations available to describe the ice/marine sediment plough interaction. The scour cross-cutting features; the scour event observed from drillships, providing lengths and scouring speeds; the iceberg groundings observed by the CSS Hudson in 1979 and the Pices IV submersible dives scheduled for this year to actually sample in scour trenches are the items to be included.

Program Link: The project should serve to provide a physical description of the iceberg scouring action within a geotechnical framework and hence help set the limits to characterise the worst case for incident scour damage in engineering and probabilistic terms.

Timing: 1974 through 1982

Team: Vaughn Barrie Group Leader, Mike Lewis, Chris Lynas, Bill Collins, Tony Randall, Chris Pereira

Status: The first submersible dive will be on the Grand Banks in August, the second series for Makkovik Bank in October.

Project: S1.4 REGIONAL ICEBERG FLUX DISTRIBUTION

Scope: The project is to generate a regional mapping of the iceberg flux distribution for the eastern Newfoundland offshore from a portion of the historical data of the International Ice Patrol.

Program Link: The object is to provide an estimate of the iceberg population dynamics over the shelf area to correlate with the description of bottom scour events. This is also an extension of our earlier work on iceberg density distribution for the Labrador offshore.

Timing: 1980 through 1981

Team: Bill Winsor Group Leader, Dennis Martin, Rob Chaulk

Status: The iceberg sighting data for years 1968-78 have been entered on a computer accessible medium.
The flux estimates have been completed based on a simple physical model for the coastal ocean.
The next item is the production of contoured flux distribution maps.

Project: S2.1 SURFICIAL GEOLOGICAL INTERPRETATIONS

Scope: This project involves drawing together a detailed surficial sediment map for each scour research area. This now covers sites on Saglek, Makkovik Banks and a complete mapping for the Hibernia region. The evidence of sediment migration, sand waves and megaripples, on the Grand Banks indicates that a more complete picture of the hydrodynamic regime for the area can be drawn with some further work. It is planned to establish a new test-site in the Hekja region of Davis Strait in 1981. The topic of special interest for this site is the importance of establishing a geological dating of sea level changes.

Program Link: A definition and understanding of the seafloor material is essential for the seabed work. It is initially applied in the interpretation of the incident scour action. The same information will be required for the geotechnical considerations when the seafloor is the foundation material during development of the site.

Timing: 1979 through 1982.

Team: Vaughn Barrie Group Leader, Mike Lewis, Chris Pereira, Chris Lynas, Bill Collins.

Status: The report for the Hibernia phase of the work is now in draft form.
The report for the Saglek Bank and Makkovik Bank of work is now in draft form.
The proposal for the Davis Strait part of the program is being put together in July and August.

Project: S2.2 SEDIMENT DYNAMICS MODEL

Scope: A sediment stability model is being considered for the Hibernia site. The two measurement/data collection instrument packages being developed to provide the information to drive the proposed models are the anemometer to measure the bottom currents, and RALPH to remotely monitor and record a lapse time photo-series, turbidity and wave action as well as record the anemometer data.

Program Link: The quantitative description of sediment rates can help resolve what time period is required to mask a scour mark or an age based on the degree of back-filling. Sediment stability will also be an important consideration of foundation scouring of bottom structures and the in-filling of dredged protection features.

Timing: 1981 through 1982.

Team: Vaughn Barrie, project manager

Status: The proposal for the transport model development is in draft form.
The organization of experiments with the existing RALPH system and the plans to build a new system are on hold until September until the development engineered at B.I.O. will have some free time to spend on the project.

Project: S3.1 SUBSTRATE GEOTECHNICAL CHARACTERIZATION

Scope: To provide a full understanding of the iceberg scouring threat it is necessary to have a description of the strength of the seabed soil which is disturbed. This will be drawn together from the various information available for the different test sites. When there is an adequate description of the substrate it is planned to collaborate with the engineering faculty to test the iceberg scouring geotechnical model.

- Program Link: This phase of the seabed program is directed to provide engineering answers about the maximum damage that can be caused by a grounding iceberg; how deep a scour, substrate stresses, scour lengths to stop an iceberg and driving forces to restart a grounded berg. The potential source for field data will be the Labrador iceberg experiment.
- Timing: 1981 through 1983.
- Team: Vaughn Barrie Group Leader, Chris Pereira, geotechnical engineer.
- Status: The project is now in the discussion stage.
The active work will be able to get underway when there are some geotechnical core samples from the test sites.
- Project: S3.2 SEABED CORER DEVELOPMENT
- Scope: The project is to design and build a seabed coring device which can remove geotechnical quality samples from the seafloor in up to 100 m. water depths with a remote controlled bottom sitting platform. At present only the dedicated drillship can take such samples of the over-compacted sediments covering much of the Canadian continental shelves. This design of corer can only take a pre-determined length of core and can be modified to take a three meter core.
- Program Link: This sampling gear was conceived and built to take the cores required to carry on the other projects of the seabed program; the soil strengths for the investigation of scouring mechanism, the geotechnical descriptions of the sea floor and to recover sample material for the surficial geological interpretations.
- Timing: 1980 to 1981.
- Team: John Jones Project Leader, A. (Pushpa) Pushpanathan.
- Status: The corer has been tested on land and is now ready for an underwater test.
The test program will give an opportunity to workout the logistics and consider a training program for using the corer at sea.

Project: S3.3 SEABED GEOTECHNICAL TESTING PLATFORM

Scope: The platform built for the corer can serve as a test platform for conducting other in-situ geotechnical tests. The deck can be modified to support a static penetrometer and a vane shear probe rotated by a hydraulic jack drive.

Program Link: This would expand the geotechnical testing capability of the platform to make in-situ soil strength measurements in the iceberg scouring program. This Type of sampling equipment will also aid collecting the data required for many seabed engineering functions such as anchoring, placing seafloor installations and surveys for the initial reconnaissance for foundations of structures.

Timing: 1981 into 1982.

Team: John Jones Group Leader, A. (Pushpa) Pushpanathan.

Status: The proposal is in draft form.

Project: RADAR GROUP - C-CORE
(Centre for Cold Ocean Resources Engineering)

Contact: David Bazeley Telephone: 709-737-8354
C-CORE (Centre for Cold Ocean Resources Engineering)
Captain Robert A. Bartlett Bldg.
Memorial University of Newfoundland
St. John's, Newfoundland A1B 3X5

PROJECTS: TABLE OF PROJECTS INFORMATION

Project: R1.1 HF OVER-THE-HORIZON RADAR

Scope: This is an evaluation of the Communications Research Centre (CRC) HF radar receiver, at Ottawa, for the measurement of oceanographic conditions and extent of sea ice cover on the Canadian East Coast. Initial queries are: Is it possible to resolve the ocean doppler spectrum from the back-scattered signal with the radar system available and can the ionospheric contribution to the signal be quantified and removed?

Program Link: This work offered the initial opportunity to deal with HF radar remote sensing where the instrumentation required was essentially already in-place.

Timing: 1980 through 1982.

Team: Ken Butt Group Leader, Gary Gidney, Chantal Roche, Dennis Martin, Terry Ridings.

Status: The main data processing software package written and the initial data reduction gives the expected doppler spectrum spikes. Presently writing a graphic package to plot the wind direction vectors.
The compilation of the available surface truth data is underway.
It is planned to transfer the computation to the pdp 11/23 when a communication link is achieved.

Project: R1.2 CODAR TECHNOLOGY TRANSFER

Scope: The proposed package is to acquire the technology and equipment for a CODAR system which can remotely measure ocean surface currents for this technical community, where it can serve as a tool for the study of iceberg drift and for slick tracking in the event of an oil-spill.

Program Link: This HF radar system represents the state-of-the-art in this technology and can provide the various government agencies and industrial operators a powerful measurement system for understanding coastal and ocean processes.

Timing: 1981 through 1983

Team: Ken Butt Group Leader, Phil Jeans, Randy Raymond, Gary Gidney, Terry Ridings.

Status: There was a formal presentation of the proposed program to an EPOA group in late May 1981.
The next phase of contract to DSS is being negotiated with funds from the Transport Development Corporation and we hope to start the work under contract by September 15th.
A single HF radar transceiver has been ordered from CODAR Technology and we plan to take delivery of the unit in mid-October.

Project: R1.3 HIGH FREQUENCY RADAR ICE EVALUATION

Scope: The initial feasibility study on HF radar indicated that this radio frequency band could offer a remote sensing capability to sort and categorise different types of ice cover. An ability to identify glacial and multi-year floes which represent a major hazard to northern shipping is of special interest.

Program Link: This project now represents the central research thrust of the work with HF radar, the application of new developments to the unique problems of the Canadian Northern Offshore.

Timing: 1981 through 1983.

Team: Ken Butt Group Leader, John Walsh, Phil Jeans, Ken Klein.

Status: The application for the NSERC grant was submitted in April. The HF radar transiever is on order from CODAR Technology Inc., delivery date October 1981.
Dr. Walsh is doing a research contract on the propagation of HF radiation over layered media, to be completed by September.

Project: R2.1 ICE SOUNDING WITH IMPULSE RADAR

Scope: This is the wrap-up phase of the ice detection program with the impulse radar. The items yet to be completed are some of the final reporting for the program and the data reduction and annotation of the various data sets, (the Lake Melville survey, the MPB comparison, etc.) to form entries to the data bank.

Program Link: The objective is to ensure a full statement of the results of the remote ice detection program and to enter the products of the impulse radar program to the C-CORE data bank where they will be available to future researches.

Timing: 1977 through 1981

Team: Ken Butt Group Leader, Randy Raymond

Status: The system has been demonstrated to measure continuous ice-thickness profiles over level ice. There are still certain ice types which can result in ambiguous readings. The data reduction and annotation is in progress. There are two technical reports due from Dr. J. Rossiter. The summary report is scheduled for November 1981.

Project: R2.2 IMPULSE RADAR APPLICATIONS

Scope: This is the bridge project for potential impulse radar applications. The primary objective is to re-think the fundamentals of electro-magnetic sounding of ice cover, especially the identification of ice type, particularly multi-year and glacial ice, from the signature of the back-scatter, irregardless if there is any bottom echo.

Program Link: This is the follow-up of the major radar project in ice detection and will also serve as technical back-up for consultant type surveys using the C-CORE airborne or ground system.

Timing: 1980 through 1982

Team: Ken Butt Group Leader, Ernie Reimer, Randy Raymond.

Status: The field work was carried out in February 1981. There was no multi-year ice in the survey area. The analytical work will follow the data reduction and annotation of the existing data sets. We will continue to take each opportunity to collect impulse radar data from different ice conditions.

Project: R3.1 SIGNAL LEVEL DISPLAY FOR MARINE RADAR:

Scope: The effort is to design, build and field test an alternate display system for a marine type radar. This is an initial assessment to establish if there is further information in the signal amplitude which can serve to categorise ice types within the radar range.

Program Link: This work is an extension of the program to monitor ice dynamics with a surface based radar.

Timing: 1981

Team: Ken Butt Group Leader, Ken Klein, Terry Ridings, Phil Jeans.

Status: The work is on schedule.
The system design is nearly finished.
The purchase of major components completed.
About two and half man-months of research effort has been put into the project.
A joint field program is planned for the early winter.

Project: HYDROCARBON GROUP - C-CORE
(Centre for Cold Ocean Resources Engineering)

Contact: David Bazeley Telephone: 709-737-8354
C-CORE (Centre for Cold Ocean Resources Engineering)
Captain Robert A. Bartlett Bldg.
Memorial University of Newfoundland
St. John's, Newfoundland A1B 3X5

PROJECTS: TABLE OF PROJECT INFORMATION

Project: H1.1 OILSPILL DETECTION

Scope: The development of a small operational tool for the identification of oilspills in ice utilizing active thermal pumping with an infrared laser. Intended as an observational aid for helicopter or light aircraft reconnaissance.

Program Link: During the Kurdistan spill great difficulty was experienced in identifying oil contaminated areas in the ice back. Considerable confusion resulted from false identifications. The sophisticated remote sensing techniques developed by CCRS were not readily available. The need for an inexpensive, portable device was identified.

Timing: 1980 - 1982

Team: E. Reimer Group Leader, T. Laidley, K. Klein, with collaborative support from R. Worsfold, B. Dawe (Remotec). Remotec will be project manager on externally funded testing contract.

Status: Feasibility studies indicated a high potential for this system. An airborne prototype is being designed and constructed while a proposal is in preparation to fund the testing of the device.

- Project: H1.2 SUBSEA CONTAINMENT (CONTRACT)
- Scope: An investigation of potential techniques for the containment of oil well blowouts at the sea floor. Includes both "think-tank" sessions and emperical testing of small scale models.
- Program Oilspill cleanup techniques and relief well operations are severely restricted in offshore regions with or without ice cover. As an alternative a sea floor containment operation might be attractive if suitable techniques can be devised.
- Timing: April to July 1981
- Team: E. Reimer Group Leader, D. Diemand, with "think tank" input from W. Winsor, J. Jones, G. Goobie, T. Laidley as well as R. Niefer (MUN Engineering), J. Guigne (NORDCO).
- Status: Contract work completed
A technique with potential for complete containment and production using more or less conventional methods has been identified. Follow-up studies and full scale tests will likely take place [Dome/COOSRA has initiated a systems engineering study].
- Project: H1.3 DRIFTERS
- Scope: An investigation of possible oilspill trajectories from offshore operations on the Grand Banks and Labrador Shelf using ocean surface drift cards.
- Program Experience from the Kurdistan oilspill indicated that available ocean current information and trajectory modelling techniques are not good enough to make accurate predictions. Emperical observations is, in this case, a useful and inexpensive alternative.
- Timing: 1979 - 1983
- Team: E. Reimer Group Leader, D. Diemand, V. Barrie with consultation from R. Trites, D. Bezanson (BIO).
- Status: In spite of scanty data from Labrador and Newfoundland the exceptionally high return rates (20%) from Europe have provided a statistical basis for inferring results. A technical report will be released in early winter. Meanwhile a second experiment has been devised in collaboration with BIO to assess the possible trajectory differences between fresh and weathered crude (tarballs).

<u>Project:</u>	H1.4 OILSPILL SCAVENGERS
<u>Scope:</u>	The development of bulk material for oilspill cleanup in Arctic waters which incorporates the combined effects of absorption and enhanced bacterial degradation. Envisaged as promising for impact mitigation in ice conditions.
<u>Program Link:</u>	At present burning and manual removal are the most effective cleanup strategies for oilspills in ice covered waters. Bacterial degradation is recognized as a natural but slow mechanism for the removal of oil from the environment. In view of the rapid pace of development in genetic engineering it seems likely that biological waste disposal techniques will become increasingly attractive. Laying aside for the moment the environmental implications of genetic engineering, the current project is seen as a demonstration of a potential technology. The project emphasis is on physical implementation in Arctic, ice covered environments.
<u>Timing:</u>	1980 - 1982
<u>Team:</u>	E. Reimer Group Leader, D. Diemand, Hardjasudarma with collaborative support from J. Gow (Biology), D. Malcolm (Engineering).
<u>Status:</u>	A porous physical substrate/carrier material has been developed. Techniques of bacterial enhancement are now being studied.
<u>Project:</u>	H1.5 OILSPILL DISPERSION PROCESS
<u>Scope:</u>	To devise a method of measuring ocean surface turbulence and empirically relating the measurement to oilspill dispersion rates.
<u>Program Link:</u>	Assessment of dispersion rates in respect to dispersant testing and with respect to operational decisions requires information as to the relationship between laboratory conditions and open ocean turbulence. Development of the electrochemical anemometer has provided a potentially simple and effective method.
<u>Timing:</u>	1980 to 1982
<u>Team:</u>	E. Reimer Group Leader, E. Woolgar, INSTRUMAR
<u>Status:</u>	preliminary, evaluation underway

<u>Project:</u>	H1.6 BAFFIN ISLAND OILSPILL
<u>Scope:</u>	A government - industry experiment to assess the respective environmental impact of dispersed and non-dispersed oil in a nearshore environment. C-CORE's specific responsibilities involve co-ordination of the physical sciences integral to the program.
<u>Program Link:</u>	This experiment (one of a suite of 5) emerged from discussions originating at the Fairmont 1978 conference. C-CORE has been involved in the planning from the beginning.
<u>Timing:</u>	1980 - 1984
<u>Team:</u>	E. Reimer
<u>Status:</u>	Major input completed by December 1981
<u>Project:</u>	H1.7 ELECTROCHEMICAL ANEMOMETER
<u>Scope:</u>	Consultation to Instrumar on anemometer development. Development of a suitable probe for Ralph! in relation to sediment dynamics measurements.
<u>Timing:</u>	1980 - 1982
<u>Team:</u>	E. Reimer Group Leader, Instrumar, V. Barrie
<u>Status:</u>	Underway with main development work being carried out by INSTRUMAR Ltd. on a mini-IRAP grant.



INFORMATION SURVEY - KINDS AND SOURCES - FOR THE
ENVIRONMENTAL ASSESSMENT AND REVIEW PROCESS:
BEAUFORT SEA HYDROCARBON PRODUCTION AND TRANSPORTATION PROPOSAL

----- Response Sheet -----

To: Federal Environmental Assessment Review Office
13th Floor, Fontaine Building
Hull, Quebec
K1A 0H3

Attention: Ms. E. MacDonald

Inquiries: 819-997-2725

To ensure timely distribution of the Survey results, this report is being distributed as a Working Document. Editorial comments, revisions, and new submissions for a future update are requested. Current entries are on word processor discs to facilitate revision. Changes should preferably be submitted directly on copy, with major additions attached.

Date: _____

Organization: _____

Contact: _____

Enclosures:

Changes in the current edition of the Survey

☐

Additions for a future update
(See Survey Format Section 5, p.5
and: attached Format Sheets)

☐

Comments

☐

Information Survey for the Environmental Assessment Review Process-
Beaufort Sea Hydrocarbon Production Proposal

A. Format - Agency Information Sheet.

1. Agency and Address.(Government department, associations, universities, commercial enterprises, or any sub-division of these).
2. Contact (Phone No.)
3. Responsibilities or Objectives Identify objectives applicable to areas north of 60°, or specifically to the Beaufort Sea Referral.
4. Areas of Expertise. Identify activities or areas of expertise relevant to the assessment of the Beaufort Sea Proposal.
5. Specific Project Information. List current projects relevant to the Beaufort Sea Proposal and attach project information sheets.
6. Information Services. Identify information services (library, data bases, etc.) and accessibility of information.
7. Publications. List publications of a general nature (Bibliographies, annual reports, summary reports, newsletters etc.)

The Beaufort Sea Hydrocarbon Development Proposal covers both environmental and social impacts of hydrocarbon production and transportation to southern markets.

Information Survey for the Environmental Assessment Review Process
- Beaufort Sea Hydrocarbon Production Proposal

B. Format - Project Information Sheet

1. Project Title
2. Geographic Study Area
3. Objectives
4. Approach and/or Progress
5. Reports or Publications
6. Anticipated Time Frame
7. Undertaken by:
 1. Agency
 2. Research Personnel
8. Contracted or funded by: (if applicable)
 1. Agency
 2. Scientific Authority
9. Contact:
Address and phone number

Include current or recent (1979-1981) projects relevant to any aspect of the "Beaufort Sea Hydrocarbon Development Proposal" as referred to the Environmental Assessment and Review Process. The referral covers both environmental and social impacts of hydrocarbon production and its transportation to southern markets.



Government
of Canada

Gouvernement
du Canada

Environmental
Assessment Review

Examen des évaluations
environnementales

FIRST UPDATE TO

INFORMATION SURVEY - KINDS AND SOURCES - FOR THE
ENVIRONMENTAL ASSESSMENT REVIEW PROCESS:
BEAUFORT SEA HYDROCARBON PRODUCTION AND TRANSPORTATION PROPOSAL

OCTOBER, 1981

compiled by
Elsie M. MacDonald

for the
Federal Environmental Assessment Review Office
Hull, Quebec

June, 1982

Canada



Government
of Canada

Gouvernement
du Canada

Environmental
Assessment Review

Examen des évaluations
environnementales

Federal Environmental Assessment
Review Office
13th Floor, Fontaine Building
Hull, Quebec K1A 0H3

1982.06.01

INFORMATION NOTE:

Re: Update - May 1982 of the "Information Survey - Kinds and Sources
- for the Environmental Assessment Review Process: Beaufort Sea
Hydrocarbon Production and Transportation Proposal. October
1981".

The attached pages are for insertion in the above noted Information Survey Report, October 1981. This report was circulated for review in December 1981 and the enclosed pages consist of corrections to the original report and new submissions.

The enclosed update pages have not yet been added to section II.2.2 - Subject Index (by Zones) to Project Information Sheets. This will be done for the next update in which this section will be revised to relate more directly to the Final Guidelines for the preparation of an Environmental Impact Statement issued by the Beaufort Sea Environmental Assessment Panel in February, 1982.

The next update is planned for October/November 1982.

E. MacDonald
Consultant, Research/Information Co-ordination

encls.

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Agency: ARCTIC PETROLEUM OPERATORS ASSOCIATION (APOA)
APOA Information Service, P.O. Box 1281, Station M,
Calgary, Alberta T2P 2L2

Contact: J. Pallister Telephone: 403-236-2344

Objectives: The APOA is a non-profit association of around 20 oil companies active in Canada's Arctic. It provides a means of undertaking joint research projects relative to operating in the Arctic environment, encourage protection of the Northern environment, provide liaison with other groups interested in the Arctic and share information.

Area of Expertise: Over 170 projects have been completed on a wide variety of subjects such as ice, environmental and oil spill studies.

Current Projects: There have been studies of specialized vehicles for use in the Arctic, and general research and information projects. Among the latter has been support of the Arctic Institute of North America for its Beaufort Sea Symposium and an Arctic Science and Technology Information System.

Information Services: APOA reports can be obtained from the address listed above. Lists of reports appear in the APOA Review. The Arctic Science and Technology Information System (ASTIS) has recently prepared a bibliography of APOA Research Projects. Abstracts are provided for all documents in the APOA bibliography. It is 74 pages and includes detailed title, author, subject, and geographical indexes. It costs \$10.00 pre-paid and is available through APOA Information Service or from ASTIS.

Publications: The APOA Review - 3 times a year

Agency: PALLISTER RESOURCE MANAGEMENT LTD.
700 - 6th Avenue S.W.
Calgary, Alberta T2P 0T8

Contact: Mr. Jeff Pallister Telephone: 403-236-2344
Telex: 03-82442/Kenting Ltd. CGY

Objectives: To provide consulting services in the areas of oil and gas exploration, development and transportation, ice engineering, including subsea activities.

Areas of Expertise: Research and development for ocean engineering, oil and gas offshore exploration equipment. A study of the marine service industry. Pallister Resource Management produces under contract the APOA Review for the Arctic Petroleum Operators Association.

Information Services: Pallister has a technical library of approximately 3000 documents. About 25% are marine related. The library dates from 1973 and includes technical reports, computerized literature searches, etc. Access for researchers who establish a need-to-know.

Current Projects: Recent projects (selected) and major activity area:

- Beaufort Sea Environmental Program (Environment)
- Oil and Gas Offshore Equipment (Ocean Engineering)
- Research and Development for Ocean Engineering (Resource Development)
- Government Policy (Resource Development)
- Potential Oil and Gas Supplies (Resource Development)
- Summarization of Petroleum Industry Arctic (Resource Development)
- Study of Marine Service Industry (Ocean Engineering)
- Proposed organization of a Research and Development Program
- Arctic Pilot Project

Agency: MACLAREN PLANSEARCH LTD.
Windmill Place, 1000 Windmill Road
Dartmouth, N.S. B3B 1L7 Telephone: 902-469-0932

Contact: Shirley A.M. Conover, Vice President
Simon G.P. Skey, Group Manager, Physical Sciences

Objectives: Consulting Service

Areas of Expertise: Computer Sciences; Economic and Social Studies Environmental Sciences; Ocean Sciences and Operations; Transportation Studies: Urban and Regional Planning; Water Resources.

Current Projects: Ice Surveillance on the Dome drill rigs (proprietary to Dome). Provision of expert personnel trained in all aspects of ice and weather surveillance as well as measurement of meteorological and oceanographic parameters. Primary function is to protect drilling rigs and islands etc. from hazards caused by ice.

Arctic Risk Study for the Environmental Protection Service: Participation with FENCO in an analysis associated with transport of oil from sites in the Beaufort and elsewhere in the Arctic to southern ports. In addition to developing risk estimates for the transporting vehicles, assessment of impacts on the biological resources and recommendations for future studies were made. Oil spill modelling including tracking, analysis and interpretation was fundamental to this work.

Agency: POLAR GAS PROJECT
P.O. Box 90
Commerce Court West
Toronto, Ontario M5L 1H3

Contact: K.G. Taylor Telephone: 416-869-2624
Supervisor
Environmental Programs

Objectives: Polar Gas is a joint public/private sector project established to transport natural gas from Canada's northern frontier to markets in the south. The project has determined that a large diameter pipeline is the most efficient transportation mode and proposes to build such a pipeline to connect gas reserves in the Arctic Islands and Mackenzie Delta/Beaufort Sea areas to markets in southern Canada.

Areas of Expertise: Since 1972 Polar Gas has invested over 80 million dollars in feasibility studies on several potential pipeline routes through the Northwest Territories. A preferred route across the central NWT to northern Ontario has been identified, but a Mackenzie Valley, an East Franklin route and a Keewatin route are also viable. An application to the National Energy Board for permission to build a pipeline is anticipated during 1983. Polar Gas staff and consultants have carried out a wide range of studies on the geotechnical, environmental, socio-economic and engineering aspects of pipelining in the Northwest Territories. The environmental and socio-economic research, and the study reports are described in Project Information Sheets.
- See Project Information Sheets 167-174

Current Projects: Environmental and Socio-Economic Impact Assessment Statements, which will form part of an application for the preferred pipeline route, are currently in preparation by Polar Gas staff and consultants.

Information Services: Project library has extensive holdings on Arctic pipelining, natural gas, energy, northern development, and environmental and socio-economic aspects of northern Canada. Non-project users by special permission or inter-library loan.

Publications: Some reports considered proprietary; most environmental and socio-economic reports (approx. 100) are published and available at selected research libraries across Canada.

Agency: TOWN OF INUVIK
P.O. Box 1160
Inuvik, N.W.T.

XOE OTO

Contact: Cynthia C. Hill
Mayor

Telephone: 403-979-2607

Objectives: The Town of Inuvik is involved in the management of the Municipality's roads, water and sanitation services, fire protection services, recreation services and facilities and the library. Other responsibilities include: bylaw enforcement, building inspection, animal control.

Areas of Expertise: The Town of Inuvik is participating in the Beaufort Sea Environmental Assessment Review Process, maintains a liaison with industry and is examining the potential impacts of hydrocarbon development on the community.

Current Projects: The Town of Inuvik prepared 2 submissions to the Beaufort Sea Environmental Assessment Review Panel concerning the Draft Guidelines for the preparation of an Environmental Impact Statement. The Town is also conducting an assessment of the current level and adequacy of Municipal Services and Infrastructure and future needs resulting from Beaufort Sea Development. Conditional on approval of a FEARO funding application this assessment will include an extensive community information and consultation program.

Information Services and Publications Copies of the submissions to the Panel and the Municipal Services and Infrastructure Assessment are available from the Town Office.

Cont. (Project Listing)

Project Information Sheet No.	Title
28	Arctic Marine Oilspill Program
29	EAMES - Eastern Arctic Marine Environmental Studies
30	Offshore wind/wave climate studies
31	Climatic study of northwestern Baffin Bay.
32	Regional climate study of the Canadian Arctic Islands and adjacent waters.
33	Arctic air temperatures relevant to steel selection for ship hulls
34	Climatic change in the Arctic
35	Environmental aspects of Arctic marine transportation: Sea state, ice and weather.
36	Annual reports of Beaufort Weather Office (BWO).
37	Operational Systems design R & D
38	None
39	Satellite ice status system R & D
40	Marine oil spill trajectories R & D
41	Wave and swell forecasting R & D
42	Sea-ice modelling R & D
43	Long term fate and effects of Balaena Bay oil spill
44	Study of ice conditions along a year round shipping route from the Bering Strait to the Canadian Beaufort Sea, June 1979.
45	Air deployable oil spill ignitor tests, Yellowknife, May 1979.

Cont. (Project Listing)

Project Information Sheet No.	Title
46	Oil and gas under sea ice, Dec. 1980
47	Ice conditions along Arctic tanker routes (to be included in volume 3 of Dome's Beaufort Sea Production, E.I.S.)
48	Sea ice motion in the southeastern Beaufort Sea, 1978.
49	Beaufort Sea winter ice experiment 1979: Oceanography
50	Beaufort Sea winter ice experiment 1981: Oceanography.
51	Arctic Marine Oilspill Program (AMOP).
52	Expanded power supply alternatives for Inuvik - Tuktoyaktuk area.
53	Physical oceanography in the Northwest Passage.
54	Fish, invertebrates and marine plants of the Southern Beaufort Sea - An overview.
55	Microbiology of water and sediments at Issunguak Artificial Island
56	Wave climate study.
57	Terrain, land use and waste drilling fluid disposal problems adjacent to exploratory wellsites in permafrost, Arctic Canada.
58	The study of coastal processes and dynamics, Southwest Banks Island, Western Canadian Arctic.
59	Responses of Peary caribou and muskoxen to helicopter harassment.
60	Inter-island movement of Peary caribou
61	Lake regimes, Mackenzie Delta, N.W.T.

Cont. (Project Listing)

Project Information Sheet No.	Title
62	Ice regime of lower Mackenzie River and Mackenzie Delta, N.W.T.
63	Northern highways hydrology study, Mackenzie Delta region, N.W.T.
64	Studies of behaviour and effects of oil spills in Arctic lands and waters and spill countermeasures, especially chemical dispersion.
65	Sub-seabottom permafrost mapping - Beaufort Sea
66	Hudson Strait seabird study - year 2 of 3
67	Seabird population studies in Lancaster Sound and vicinity.
68	Frontier subsea pilot production project (Beaufort)
69	Extended well production test riser system for Dome Petroleum
70	The feasibility of underwater containment of subsea oil spills in Arctic waters (Oil spill containment study - 1979)
71	Subsea containment study task 3 (C-CORE: 426-0)
72	Design study of oil skimmer for use in Canadian waters
73	CanOcean Participation - Arctic Pilot Project (A.P.P.)
74	4th Service System design (Arctic service system - In-house R & D)
75	National Energy Program - Energy R & D Oil and Gas Task 3.26 - Offshore temperature studies.
76	National Energy Program - Energy R & D: Oil and Gas Task 7.6. Study of shallow thermal aspects for pipelining.

Cont. (Project Listing)

Project Information Sheet No.	Title
77	National Energy Program - Energy R & D: Oil and Gas Task 3.1. Fundamental studies of moisture migration.
78	National Energy Program. Energy R & D: Oil and Gas Task 2.2. Geological and Geophysical studies of gas hydrates.
79	Water resources officer - Northern Affairs Program, Northern Operations Branch, District Operations, Inuvik, NWT
80	Northern Technology Unit Projects
81	Coastal characteristics of the Northwest Passage.
82	Regional Analysis study of the western Arctic Archipelago Marine Region #4
83	Parks analysis Natural Region #26
84	Shoreline analysis, Alaska & Arctic Canada
85	Coastal geology mapping, central Sverdrup Basin, N.W.T.
86	Beaufort Sea coastal video survey
87	Northwest Passage video-tape survey
88	BIOS Oil Spill
89	APOA Beaufort Oil Spill Workshop
90	AMOP spill site selection
91	EAMES Atlas Workshop
92	Southeast Newfoundland oil spill countermeasures study.
93	Tuktoyaktuk Harbour Master Plan
94	Transportation of gas and oil from the Arctic Islands

Cont. (Project Listing)

Project Information Sheet No.	Title
95	Laboratory study of heat transfer at ice/water interface.
96	Tanker terminals feasibility for a petrochemical complex.
97	Feasibility study, deepwater transshipment storage facility.
98	Risk analysis for pipeline construction
99	Oil and gas production facilities for offshore Labrador
100	Ice management for Arctic LNG terminal.
101	Compilation of ice forces against structures
102	Ice studies for exploratory drilling system
103	Crossing of ship tracks in Barrow Strait
104	Stress analysis of Barrow Strait ice cover
105	Production and gathering system; Design and project management
106	Economic development plan. (Discontinued)
107	Oil and gas exploration supply base
108	Geotechnical investigations of proposed Mackenzie highway.
109	Yukon grizzly bear studies
110	Study of the tourism potential for the Mackenzie Valley communities.
111	Market opportunities - North of 60°
112	Transportation feasibility studies
113	Financial analysis of Arctic pipeline applications.

Cont. (Project Listing)

Project Information Sheet No.	Title
114	Radarsat Project
115	Oceanographic monitoring in Barrow Strait
116	Ice studies in the Central Arctic
117	G-UMPS (Gyroscope unmanned profiling system).
118	Oceanography of Hudson/James Bays
119	Hire North evaluation study
120	Socio-economic impact assessment of the Arctic Pilot Project on selected high Arctic communities.
122	Assessment of the socio-economic impacts and damages resulting from the Grand Rapids 1960-1980 (with projections to year 2000)
123	Construction and use of winter roads during pipeline construction, to reduce terrain and vegetation impacts
124	Candidate Natural Areas of Canadian Significance and Natural Sites of Canadian Significance in Natural Region 8 and in Natural Region 7.
125	Regulatory consulting services to private industry.
126	Beaufort coastal survey.
127	Mckinley Bay, Beaufort Sea
128	Ocean Dumping Standardization
129	Monitoring and assessment of the commercial fishery potential in the Mackenzie Delta.

Cont: (Project Listing)

Project Information Sheet No.	Title
163	Ice behaviour C-CORE Program
164	Seabed Group (C-CORE)
165	Radar Group (C-CORE)
166	Hydrocarbon Group (C-CORE)
167	Environmental Statement - West Hudson Bay Route
168	Socio-Economic Statement - West Hudson Bay Route
169	Biophysical Research and Data Collection - West Hudson Bay Route
170	Socio-Economic Research and Data Collection - West Hudson Bay Route
171	Environmental Statement - "Y" Route to Longlac Route
172	Socio-Economic Statement - "Y" Line to Longlac Route
173	Biophysical Research and Data Collection - "Y" Line to Longlac
174	Socio-Economic Research and Data Collection - "Y" Line to Longlac
175	Preliminary environmental assessment of proposed harbour sites at McKinley Bay and Baille Islands

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone I (cont.)		
3.1.4	<u>Geology, Coastal Morphology and Terrain</u>	
	Geotechnical Research 1980-1981. Beaufort Sea Production Development. Dome Petroleum Ltd.	4
	Biological - Chemical Research 1980, Beaufort Sea Production Development. Dome Petroleum Ltd. (Proj. 7. Coastal survey)	7
	Surficial geology and geomorphology. Mackenzie Bay - Continental Shelf.	18
	Coastal reconnaissance of the Sverdrup Basin, N.W.T.	20
	Establishment of environmental design parameters for Beaufort Sea development - Geotechnical information requirements.	23
	The study of coastal processes and dynamics, Southwest Banks Island, Western Canadian Arctic.	58
	Lake regimes, Mackenzie Delta, N.W.T.	61
	Ice regime of lower Mackenzie River and Mackenzie Delta, N.W.T.	62
	Coastal geology mapping, central Sverdrup Basin, N.W.T.	85
	Beaufort Sea coastal video survey	86
	Northwest Passage video-tape survey	87
	Seabed Group (C-CORE)	164
3.1.5	<u>Permafrost and Thermal Regime (including hydrates)</u>	
	Establishment of environmental design parameters for Beaufort Sea development - Geotechnical information requirements.	23
	Sub-seabottom permafrost mapping - Beaufort Sea	65
	National Energy Program - Energy R & D Oil and Gas Task 3.26 - Offshore temperature studies.	75

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone I		
3.1.5 (cont.)		
	National Energy Program - Energy R & D: Oil and Gas Task 7.6. Study of shallow thermal aspects for pipelining.	76
	National Energy Program - Energy R & D: Oil and Gas Task 3.1. Fundamental studies of moisture migration.	77
	National Energy Program. Energy R & D: Oil and Gas Task 2.2. Geological and Geophysical studies of gas hydrates.	78
3.2 <u>Biological Environment</u>		
3.2.1 <u>Marine and Freshwater Systems (plants and animals)</u>		
	Biological - Chemical Research 1980, Beaufort Sea Production Development. Dome Petroleum Ltd. (Proj. 2 Environmental monitoring of dredging activities Proj. 4 Whale surveys - Tuktoyaktuk Peninsula. Proj. 5 Seal surveys, Beaufort Sea (Arctic Islands).	7
	Beaufort Sea Production Environmental Studies 1979-1980. Beaufort Sea Production Development. Dome Petroleum Ltd. (Proj.3 Environmental baseline data - Kopanoar specific, Beaufort Sea general. Proj. 7 Ecology of the southern Beaufort Sea and Mackenzie Delta: An annotated bibliography. Proj. 8 An engineering and environmental study of the use of explosives in ice).	8
	Fish, invertebrates and marine plants of the Southern Beaufort Sea - An overview.	54
	Microbiology of water and sediments at Issunguak Artificial Island	55
	Beaufort coastal survey.	126
	Mckinley Bay, Beaufort Sea	127
	Monitoring and assessment of the commercial fishery potential in the Mackenzie Delta.	129

II.2.2 Subject Index (by Zones)

ZONE II: Terrestrial areas North of 60°

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
1. <u>GENERAL</u>		
	Workshop on the impact of the Dempster Corridor on the Mackenzie Delta	24
	Environmental Assessment Panel Projects.	162
2. <u>PROPOSAL (DESIGN) RELATED</u>		
	Northern highways hydrology study, Mackenzie Delta region, N.W.T.	63
	Risk analysis for pipeline construction	98
	Financial analysis of Arctic pipeline applications.	113
	Construction and use of winter roads during pipeline construction, to reduce terrain and vegetation impacts	123
3. <u>ENVIRONMENTAL SETTING</u>		
3.0 <u>Ecosystem Studies</u>		
	Northlands Ecoregions	15
	Ecodistrict mapping for the Northwest Territories.	16
	Candidate Natural Areas of Canadian Significance and Natural Sites of Canadian Significance in Natural Region 8 and in Natural Region 7.	124
	Northern land use information series mapping project.	143
3.1 <u>Physical Environment</u>		
3.1.2 <u>Climate and Air Quality</u>		
	Climatic change in the Arctic	34

<u>Subject Categories</u>	<u>Project Title</u>	<u>Project Information Sheet No.</u>
Zone II (cont.)		
3.1.4	<u>Geology, Terrain and Coastal Morphology</u>	
	Ice regime of lower Mackenzie River and Mackenzie Delta, N.W.T.	62
	Geotechnical investigations of proposed Mackenzie highway.	108
3.3	<u>Socio-Economic Environment</u>	
	Yukon grizzly bear studies	109
	Study of the tourism potential for the Mackenzie Valley communities.	110
	Market opportunities - North of 60°	111
	Transportation feasibility studies	112
	Hire North evaluation Study	119
	Historical development of current patterns of Inuit culture and implications with respect to future development.	144
4.	<u>IMPACT STUDIES</u>	
4.1	<u>Physical Environment Effects</u>	
	Terrain, land use and waste drilling fluid disposal problems adjacent to exploratory wellsites in permafrost, Arctic Canada.	57
	Terrain - vehicle interaction - Keewatin	154
4.3	<u>Socio-Economic Effects</u>	
	Long term fate and effects of Balaena Bay oil spill	43
	Study of the tourism potential for the Mackenzie Valley communities.	110
	Assessment of the socio-economic impacts and damages resulting from the Grand Rapids 1960-1980 (with projections to year 2000)	122

Project: COASTAL EROSION - SEDIMENTATION, NORTHERN SOMERSET ISLAND, N.W.T.

Geographic Area: Somerset Island, N.W.T.

Objectives: To map the modern sedimentary environments of the coasts of northern Somerset Island and adjacent islands with particular reference to the processes controlling erosion, transportation and deposition of sediments and the role of permafrost and sea ice movement. To provide basic data that will help assess the impact of the various human activities on the natural balance of processes with particular reference to gas pipeline concerns.

Approach Progress: The proposed project "Coastal erosion-sedimentation, northern Somerset Island" is a field oriented study of the rates and intensities of erosive and sedimentary processes relating to an Arctic sea ice and permafrost environment.

During 1974 a general reconnaissance of the entire coastal strip was made with detailed work and bench marks to be established. During 1975 and 1976 detailed observations of investigation will be completed along the coasts of Barrow Strait with special reference to Somerset, Bathurst, Lowther, Russell and S.W. Devon Islands.

During 1979-80, an office study to analyze previously collected field data was carried out. Attention was focused on the seasonal fluctuations of beach thaw and the effect of permafrost on coastal processes in the Arctic. It represents the first detailed study of the beach thermal regime and rates of thaw on coarse sediment beaches in the eastern Arctic Islands. Thaw beneath the beach foreshore zone is directly related to the salinity and temperature of the nearshore water and because of the presence of brine the thaw characteristics are much different than beneath the beach backshore zone. The ice-bonded sediment prevents large scale changes to the coast during storm wave conditions because of its resistance to erosion.

Reports: Taylor, R.B., 1979. Beach thaw depths: seasonal and short term fluctuations, Canadian Arctic Islands (abstract) submitted to N.R.C. Canadian Coastline Conference.

Taylor R.B., 1980. Beach thaw depth and the effect of ice-borded sediment on beach stability, Canadian Arctic Islands; in Canadian Coastal Conference 1980, Proceedings. NRC, pp 103-121

Taylor R.B., 1980. Coastal Environmental along the northern shore of Somerset Island, District of Franklin; in the Coastline of Canada, S.B. McCann, editor; Geological Survey of Canada, Paper 80-10, pp 239-250.

Taylor, R.B., 1977. The Occurrence of Grounded Ice Ridges and Shore Ice Piling Along the Northern Coast of Somerset Island, N.W.T. Arctic 31 (2), 133-149.

Taylor, R.B., 1978. Beach Changes, Northern Somerset Island, Proceedings of the Fourth International Conference on Port and Ocean Engineering under Arctic Conditions, Memorial University, Nfld., 1978, pp. 904-915, V. II.

W.B. Barrie, B.D. Bornhold, D.A. Hodgson, R.G. Jubb, P. McLaren, R.B. Taylor, 1978. Coastal Reconnaissance for Marine Terminal Planning in the High Arctic. Internal Report to Strategic Studies Branch Transport Canada, 1978, 328 pp. Geological Survey of Canada, Open File 633.

Taylor, R.B., 1980. Coastal Environments along the Northern Shore of Somerset Island, District of Franklin. The Coastline of Canada, S.B. McCann, Editor; Geological Survey of Canada, Paper, 80-10, pp. 239-250, 1980.

Time Frame: Ongoing.

Undertaken Atlantic Geoscience Centre
By: Environmental Marine Geology, Coastal Geodynamics
Geological Survey of Canada
Dept. Energy, Mines & Resources.
Project Leader - R.B. Taylor

Contact: R.B. Taylor Telephone: 902-426-7726
Atlantic Geoscience Centre
Geological Survey of Canada
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
B2Y 4A2

Project: LAKE REGIMES, MACKENZIE DELTA, NWT

Geographic Area: Mackenzie Delta

Objectives: Determine the water level regimes of a variety of lakes in the Mackenzie Delta under current Mackenzie River flow conditions, in order to assess the potential impact of increased flow regulation upon the Mackenzie Delta. In order to broaden the data base and further investigate the potential regulatory effects upon the Delta lakes, a preliminary analysis of water quality characteristics will be undertaken in 1982.

Approach
Progress: Record lake and channel water levels by means of time-lapse photography of staff gauges. Pilot study began in 1980, at one area, and was expanded in 1981 to a second area. Expect to instrument a third area in 1982.

Reports: None as yet

Time Frame: Commenced 1980 - Terminate 1984.

Undertaken By: Northern Hydrology Section, Surface Water Division,
National Hydrology Research Institute, Environment Canada

Research Personnel: S.C. Bigras,
A.C.D. Terroux and J.C. Anderson

Funded by: Environment Canada

Contact: S.C. Bigras Telephone: 819-997-2369
Northern Hydrology Section
Surface Water Division
National Hydrology Research Institute
Ottawa, Ontario K1A 0G7

Project: ICE REGIME OF LOWER MACKENZIE RIVER AND MACKENZIE DELTA

Geographic Area: Mackenzie River below Ft. Norman; Mackenzie Delta

Objectives: To obtain information on processes and timing of freeze-up and break-up in the Mackenzie Delta channels and Mackenzie River below Fort Norman.

Approach Progress: Field work in April (measurement of ice thickness), May and June (aerial photography, to record pattern and timing of break-up and location of jams). Water temperature recordings; to monitor amount and determine sources of heat available for melting and freezing.

Reports: In preparation, for Mackenzie River Basin Committee.

Time Frame: 1981-82 is the second year of this study. The planned length of this study is 5 years.

Undertaken By: Northern Hydrology Section, Surface Water Division
National Hydrology Research Institute, Environment Canada

Research Personnel: A.C.D. Terroux

Funded by: Environment Canada

Contact: A.C.D. Terroux Telephone: 819-997-2385
Northern Hydrology Section
Surface Water Division
National Hydrology Research Institute
Ottawa, Ontario K1A 0E7

Project: NORTHERN HIGHWAYS HYDROLOGY STUDY, MACKENZIE DELTA REGION, N.W.T.

Geographic Area: Mackenzie Delta Region, Inuvik-Tuktoyaktuk corridor.

Objectives: Provide hydrologic information relevant to the design and construction of the proposed Inuvik-Tuktoyaktuk Highway especially with regard to the sizing of culverts. This is to be accomplished through the collection and analysis of data on snowpack water equivalent, rainfall, discharge and icings at a number of drainage basins to be crossed by the highway.

In so doing, obtain an understanding of processes such as runoff response of different basin types to snowmelt and rainfall. Determine water balance component magnitudes and variations in the tundra and taiga environments of the region.

Approach
Progress: Field Work May-Sept.: collect data on snowpack water equivalent, precipitation, air temperature, discharge and note occurrence of icings at a minimum of four drainage basins along the route of proposed Inuvik-Tuk Highway. (Co-operate with Water Survey of Canada).

Office study, Oct.-Apr.: compilation and analysis of field data; preparation of a progress report for DIAND.

Reports: Anderson, J.C. (1980). "Hydrologic studies in the Mackenzie Delta region, N.W.T., 1979". Internal report to Northern Roads Environmental Working Group, DIAND, Ottawa. 39 p. & appendix.

Anderson, J.C. and A.W. Gell (1980). "Hans Creek icing study: 1979". Internal report to Northern Roads Environmental Working Group, DIAND, Ottawa, 12 p.

Time Frame: No specific termination date at present; commenced 1975.

Undertaken
By: Northern Hydrology Section, Surface Water Division
National Hydrology Research Institute, Environment Canada
Research Personnel: J.C. Anderson, S.C. Bigras, A.C.D. Terroux

Funded by: DIAND and Environment Canada

Contact: J.C. Anderson Telephone: 819-997-2385
Northern Hydrology Section
Surface Water Division
National Hydrology Research Institute
Ottawa, Ontario K1A 0E7

- Project: STUDIES OF THE BEHAVIOUR AND EFFECTS OF OIL SPILLS IN ARCTIC LANDS AND WATERS AND SPILL COUNTERMEASURES, ESPECIALLY CHEMICAL DISPERSION.
- Geographic area: Laboratory work in Toronto, field work in Mackenzie Valley (Norman Wells, Inuvik, Tuktoyaktuk).
- Objectives: To understand better the behaviour of oil spills and thus better identify any adverse effects and develop more effective clean-up or restoration procedures.
- Approach Progress: This project has been underway since 1971 and has resulted in a number of reports. Several aspects are currently under study, especially
- i) chemical dispersion of oil spill
 - ii) oil spill behaviour at sea (evaporation, spreading, emulsion formation, adhesion to shorelines, mathematical modelling, general impact assessment, etc.
 - iii) oil spill behaviour on arctic shorelines
 - iv) oil spill behaviour on arctic soils
 - v) toxicity of oil to marine organisms
- Reports: Selected recent publications (from 1976).
- Mackay, D., 1977. "Oil from the Beaufort Sea: A personal viewpoint". The Beaufort Seer, February 1977.
- Mackay, D., "Commentary on offshore drilling in the Beaufort Sea" presented at the conference (November 1975) and published in the Proceedings "Mackenzie Delta: Priorities and Alternatives: Canadian Arctic Resources Committee, Ottawa
- Mackay, D., "Pipeline Yes: Today's Delay only means Tomorrow's Crisis", Macleans, p. 22, May 30, 1977.
- Brodsky, L., Charles, M.E., Greene, G.D., Mackay, D., "The use of deflectors for the deployment of oil booms at an angle to river currents". Report prepared for and published by the Petroleum Association for the Conservation of the Canadian Environment, 1977.
- Mackay, D., "Oil in the Arctic: Some personal views on inputs, countermeasures, effects and sanctuaries", Spill Technology Newsletter, 2 (2), March-April 1977.
- Gainer, J.G., Logan, W.J. and Mackay, D., (Editors) Proceedings of the Sixth Arctic Environmental Workshop, Fairmont, B.C., April 1977. Published as report EE6 of the Institute for Environmental Studies, University of Toronto.

Project: CANOCEAN PARTICIPATION IN ARCTIC PILOT PROJECT (A.P.P.)

Geographic Area: Melville Island and surrounding area.

Objectives: The A.P.P. is a system for the delivery of natural gas from Northern Melville Island to an LNG liquefaction plant and port facility on the South Coast of the Island. From there, the LNG will be transported to Southern markets in Canada in ice-breaking LNG carriers operating on a year-round basis. CanOcean is presently involved with the A.P.P. consortium on various aspects of the project including the design of the LNG loading facilities, LNG carriers, and pipelines. In addition, CanOcean is the NOVA representative at many of the consortium working committee meetings.

Approach (a) in-house expertise;
Progress: (b) thorough review of existing literature.

Reports: Not yet determined.

Time Frame: Ongoing

Undertaken By: CanOcean Resources Ltd.
Project Engineers - Manfred Schaper, Peter Metcalf.

Funded by: Arctic Pilot Project (A.P.P.) consortium consisting of:
Dome Petroleum
Petro-Canada
TransCanada Pipeline
Melville Shipping
PanArctic
NOVA, An Alberta Corporation

Contact: John English, P.Eng. Telephone: 604-524-4451
Manager of Communications and Sales Coordination
CanOcean Resources Ltd
New Westminster, B.C.
V3M 5P8

Project: 4TH SERVICE SYSTEM DESIGN. (Arctic Service System - In-House R & D)

Geographic Area: Variety of offshore areas, including Canada's Arctic and East Coast areas.

Objectives: To design an offshore service system that would be suitable for supporting subsea operations in a variety of areas including the Beaufort Sea, Arctic Islands, and Canadian East Coast offshore areas.

Approach Progress: (a) in-house expertise based on more than a decade of experience at operating offshore service systems;
(b) thorough review of existing literature;
(c) thorough evaluation of other existing or planned service systems.

Reports: None.

Time Frame: Service System to be available '88-'89.

Undertaken By: CanOcean Resources Ltd.
Project Engineer, Ernie Sjöholm.

Funded by: In-house research and development.

Contact: John English, P.Eng. Telephone: 604-524-4451
Manager of Communications and Sales Coordination
CanOcean Resources Ltd.
New Westminster, B.C.
V3M 5P8

Project: COASTAL CHARACTERISTICS OF THE NORTHWEST PASSAGE

Geographic Area: Alaska and Canadian Arctic Coast

Objectives: To provide shoreline data for the development of an EIS for northern marine transportation routes.

Approach Progress: As part of a continuing study of the environmental impacts of northern hydrocarbon developments, Dome Petroleum has contracted Woodward-Clyde to prepare a shoreline analysis of the coasts of the Northwest Passage. This study encompasses the coasts between the mouth of the Yukon River, Alaska, and Cape Henry Kater on Baffin Island, N.W.T., including Prince of Wales Strait, Viscount Melville Sound and Lancaster Sound.

The study will focus on a detailed description of the physical coastal character and of the shore-zone processes on a section-by-section basis. Examples of repetitive shoreline types that occur within the study region are illustrated and described.

Undertaken By: Woodward-Clyde Consultants.

Funded by: Dome Petroleum Ltd.

Contact: Dr. E.H. Owens Telephone: 604-381-5811
Woodward-Clyde Consultants
16 Bastion Square
Victoria, B.C. V8W 1H9

Project: REGIONAL ANALYSIS STUDY OF THE WESTERN ARCTIC ARCHIPELAGO
MARINE REGION #4

Geographic Area: Western Canadian Arctic

Objectives: Identify natural areas and sites of Canadian significance in the Western Arctic Marine Region.

Approach Progress: The region was described and mapped in terms of the various "natural themes" which exist within the Western Arctic. The theme categories relate to various oceanographic, geologic, physiographic, and biologic characteristics which are considered important for inclusion within a national park. Each natural theme is assessed for its representativity within the region (i.e., is it common, uncommon, rare, or exceptional?) and also its "naturalness" (i.e., the extent of alteration by man); by grouping these assessments in a matrix form, a ranking of marine areas was established. The list of marine areas identified by this study will be used to select potential marine park sites on the basis of the selection criteria outlined in Parks Canada Policy.

Reports: Regional Analysis of the Western Arctic Archipelago Marine Region #4.

Time Frame: Completed

Undertaken By: Woodward-Clyde Consultants

Contracted/ Funded by: Parks Canada, Dept. of Environment.

Contact: Dr. J.R. Harper Telephone: 604-381-5811
Woodward-Clyde Consultants
16 Bastion Square
Victoria, B.C. V8W 1H9

John A. Carruthers Telephone: 819-994-3011
Chief
National Parks System Division
Les Terrasses de la Chaudière
10 Wellington Street
Hull, Quebec
K1A 1G2

Project: PARKS ANALYSIS NATURAL REGION #26

Geographic Area: Baffin Island, N.W.T.

Objectives: To identify natural areas and sites of Canadian significance in Northern Davis Strait (Natural Region 26).

Approach
Progress: The region is described and mapped in terms of the various "natural themes" (geology, physiography, climate, soils, hydrology, vegetation, etc.) which exist within the Natural Region (Baffin Island). Each of the natural themes is then assessed for its representativity within the region (i.e., is it common, uncommon, rare, exceptional?) and also its "naturalness" (i.e., the extent of alteration by man), and by grouping these assessments in a matrix form, a ranking of candidate areas was established. The list of candidate areas identified by this study will be used to select potential national park sites on the basis of the selection criteria outlined in Parks Canada Policy. Study is completed.

Undertaken By: Woodward-Clyde Consultants.

Contracted/
Funded by: Parks Canada, Dept. of Environment.

Contact: Dr. J.R. Harper Telephone: 604-381-5811
Woodward-Clyde Consultants
16 Bastion Square
Victoria, B.C. V8W 1H9

John A. Carruthers Telephone: 819 994-3011
Chief
National Parks System Division
National Parks Branch
Les Terrasses de la Chaudière
10 Wellington Street
Hull, Quebec K1A 1G2

Project: SHORELINE ANALYSIS, ALASKA & ARCTIC CANADA

Objectives: Definition of shoreline terrain characteristics and sensitivity for possible Arctic tanker route assessment and planning.

Approach
Progress: Woodward-Clyde Consultants has been requested to prepare a series of maps that define shoreline character for the coasts of Alaska and Canada north of 60°. The maps will be prepared from existing data and information and will be used to assess potential tanker routes and to evaluate the potential damage from tanker accidents.

Undertaken
By: Woodward-Clyde Consultants

Contracted/
Funded by: Arctic Sciences Ltd.

Contact: Dr. E.H. Owens
Woodward-Clyde Consultants
16 Bastion Square
Victoria, B.C. V8W 1H9

Telephone: 604-381-5811

Project: PRODUCTION AND GATHERING SYSTEM, DESIGN AND PROJECT MANAGEMENT.

Geographic Area: Prudhoe Bay, Alaska.

Objectives: To provide Design Management and Support services for new production and gathering facilities.

Approach Progress: Project and construction management, engineering design (preliminary and detailed) and support services for the installation of new production and gathering facilities in the Prudhoe Bay oil producing area of Alaska. The project involved the expansion of existing facilities for connecting up to 60 additional wells. The design included well pad buildings and related infrasture, more than 161 km of flow lines and additional modules for three major crude-oil gathering centers. The approximate value of the project to the client was \$200 million.

Reports: Submitted to client.

Time Frame: Completed.

Undertaken By: Santa Fe Engineering Services Co.

Funded by: SDHIO Petroleum Company.

Contact: Mr. Y.M. Maurette Telephone: 403-253-9161
Vice President
Acres-Santa Fe Corporation
Suite #450, 6712 Fisher Street S.E.
Calgary, Alberta T2H 2A7

Project: ECONOMIC DEVELOPMENT PLAN (DISCONTINUED)

Geographic Area: Inuvik, Northwest Territories.

Objectives: Acres' is presently providing economic planning expertise to the Town of Inuvik's Economic Planning Committee for the design of an overall comprehensive economic development plan. The planning process will provide specific cost-benefit analysis as well as an on-going analysis and interpretation of government policies and their ramification and implications for the Town of Inuvik.

Approach Progress: An in-depth description and analysis of population, locational, and economic characteristics plus locational and population activity relationships will be presented with emphasis on key economic indicators. Based on this description of Inuvik's economic circumstances, an economic opportunity assessment will be conducted and a Model of Inuvik's Economic Community will be formulated. Growth projections related to the various development scenarios will be calculated to assist in establishing realistic economic development targets.

During the planning process, community involvement will be encouraged through work-shops and public information meetings. Finally, the economic development plan and strategy will provide new dimensions in terms of enterprise, base sector and non-base sector development and methods for increased local participation in Beaufort Sea resource developments.

Reports:

Time Frame: Ongoing.

Undertaken By: Acres Consulting Services Ltd.

Funded by: Town of Inuvik

Contact: Dr. Si Brown Telephone: 604-683-9141
Acres Consulting Services Ltd.
8th Floor, 800 West Pender Street
Vancouver, B.C. V6C 2V6

Update Information February 1982.
This project has been discontinued.

Project: CONSTRUCTION AND USE OF WINTER ROADS DURING PIPELINE CONSTRUCTION, TO REDUCE TERRAIN AND VEGETATION IMPACTS.

Geographic Area: Alaska, Yukon, N.W.T. in general, field tests at Quill Creek, Yukon.

Objectives: Evaluate use of various types of winter road (snow, ice-capped, ice aggregate) as work pads for pipeline construction and their effectiveness in protecting sensitive permafrost terrain. Conduct literature review, develop construction specifications and conduct field tests.

Approach Progress: Study underway. Note: A similar study was previously conducted at Norman Wells, N.W.T. in 1973.

Reports: Report on Norman Wells winter road research study, 1973. Snow and ice roads: ability to support traffic and effects on vegetation. K.M. Adam and H. Hernandez. 1977. Arctic 30 (1): 13-27.

Construction and testing of an ice aggregate work pad at Quill Creek testing facility (1981).

Time Frame: Scheduled completion - summer 1981.

Undertaken By: Interdisciplinary Systems Ltd., Winnipeg.

Funded by: For current study - Foothills Pipe Lines (Yukon) Ltd.
For 1973 study - Canadian Arctic Gas Study Ltd.

Contact: Dr. K.M. Adam Telephone: 204-453-3745
Interdisciplinary Systems Ltd.
966 Waverley Street
Winnipeg, Manitoba
R3T 4M5

Project: CANDIDATE NATURAL AREAS OF CANADIAN SIGNIFICANCE AND NATURAL SITES OF CANADIAN SIGNIFICANCE IN NATURAL REGION 8 AND IN NATURAL REGION 7.

Geographic Area: Region 8 - Mackenzie Mountains area in B.C., Yukon, N.W.T.
Region 7 - Northern Interior Plateau and Mountains in B.C., Yukon, N.W.T.

Objectives: Identify candidate Natural Areas and Natural Sites of Canadian Significance

Approach Progress: Completed

Reports: Report on Natural Areas of Canadian Significance and Natural Sites of Canadian Significance in Natural Region 7.

Report on Natural Areas of Canadian Significance and Natural Sites of Canadian Significance in Natural Region 8.

Time Frame: Completed December 1980.

Undertaken By: Interdisciplinary Systems Ltd., Edmonton.

Funded by: Parks Canada, Ottawa.

Contact: L.E. Hurwite Telephone: 819-994-3011
Dr. A. Garbutt
Interdisciplinary Systems Ltd.
107 Centre 104
5240 Calgary Trail
Edmonton, Alberta T6H 5G8

John A. Carruthers Telephone: 819-994-3011
Chief
National Parks System Division
Les Terrasses de la Chaudière
10 Wellington Street
Hull, Quebec

Project: ONSHORE IMPACTS OF OFFSHORE HYDROCARBON DEVELOPMENT: AN ANNOTATED BIBLIOGRAPHY.

Objectives: To bring together in one place a set of comments on articles, reports etc. ... relating to the onshore impacts of offshore hydrocarbon development - and which may be of interest and use in the Canadian situation.

Approach
Progress: Attention was focused on publication which raise substantive issues regarding onshore impacts and which make specific recommendations.

Reports: Report to the Federal Activities Assessment Branch, Policy Planning and Assessment Directorate, Environment Canada - March 31, 1981. Onshore impacts of offshore hydrocarbon development: An annotated bibliography.

Kwamera, Felix A., C. Brassard, and D. Wrisht. September 1981. Onshore Impacts of offshore hydrocarbon development: An annotated bibliography. Update.

Funded by: Federal Activities Assessment Branch Policy Planning and Assessment Directorate, Environment Canada.

Contact: R. Baker Telephone: 819-997-1731
Federal Activities Assessment Branch
Environment Canada
351 St. Joseph Blvd.
Place Vincent Massey
Hull, Quebec K1A 1C4

Project: UPTAKE AND RETENTION OF PETROLEUM HYDROCARBONS IN TISSUE OF BENTHOS.

Geographic Area: Cape Hatt, Northern Baffin Island.

- Objectives:
- a) To quantify the short-term uptake and retention of petroleum hydrocarbons in benthic fauna during an in-situ exposure to crude oil and chemically dispensed crude oil, and to provide a baseline for a long-term assessment of petroleum hydrocarbon retention.
 - b) To determine the correlation between petroleum hydrocarbon concentration in tissues and short/long-term population and physiological effects measures as part of other biological studies.
 - c) To determine the correlation between petroleum hydrocarbon concentration in the tissue to the concentrations measured in the exposure media (water and sediment samples).

Approach
Progress: Biological samples will be collected in at least three sampling periods, including a pre-spill sample. Three standardized sampling sites will be chosen in each of three test bags (control, surface oil treated, dispersed oil treated). The largest number of samples will be analyzed for petroleum hydrocarbon residues by spectrofluorescence. Pooled samples representative of index species, sampling time, and dosing conditions will be assayed by capillary gas chromatography-mass spectrometry methods.

A total of eight species, representative of several trophic levels and feeding habits will be assessed. Hydrocarbon loading will be correlated with toxic responses to treatment, in particular changes in community structure, physiological condition indices, and pathological damage.

Reports: The project will form a Baffin Island Oil Spill (BIOS) Project Report, and will also lead to one or two reviewed research papers published in the primary environmental biology literature.

- Time Frame:
- a) Experimental Phase - July to September 1981, with a follow-up sample in July or August 1982.
 - b) Analytical Phase - 6 months following the experimental phase(s).
 - c) Reports - 1st report ready by March 1982.

Project: POLAR GAS PROJECT
Environmental Statement - West Hudson Bay Route

Geographic Areas: Proposed Pipeline Route: Melville Island to Cornwallis Island via Bathurst Island; Barrow Strait; Somerset Island; Boothia Peninsula; to Longlac, Ontario via vicinities of Spence Bay and Baker Lake, NWT; Churchill, Manitoba; and Pickle Lake, Ontario.

Objectives: The Environmental Statement was prepared as part of an application to federal regulatory agencies for permission to build a natural gas pipeline from the Arctic Islands to southern Canada.

Approach/Progress: The Environmental Statement was submitted to the Department of Indian Affairs and Northern Development and to the National Energy Board in December, 1977. The application was subsequently withdrawn pending investigation of alternative routes. The Statement was prepared by Polar Gas staff with assistance from senior Biophysical consultants.

Reports: The Environmental Statement consists of the following: Volume V, Public Interest, Part A, Environmental Statement, 9 Chapters and Atlas.
Copies have been distributed to appropriate government agencies and the National Science Library.

Time Frame: Filed 1977, withdrawn 1979.

Undertaken By: Polar Gas staff and senior biophysical consultants.

Contact: K.G. Taylor, Supervisor
Environmental Programs
Polar Gas Project
P.O. Box 90,
Commerce Court West
Toronto, Ontario M5L 1H3

Project: POLAR GAS PROJECT
Socio-Economic Statement - West Hudson Bay Route

Geographic Areas: Proposed Pipeline Route: Melville Island to Cornwallis Island via Bathurst Island; Barrow Strait; Somerset Island; Boothia Peninsula; to Longlac, Ontario via vicinities of Spence Bay and Baker Lake, NWT; Churchill, Manitoba; and Pickle Lake, Ontario.

Objectives: The Socio-Economic Statement was prepared as part of an application to federal regulatory agencies for permission to build a natural gas pipeline from the Arctic Islands to southern Canada.

Approach/Progress: The Socio-Economic Statement was submitted to the Department of Indian Affairs and Northern Development, and to the National Energy Board in March, 1978. The application was subsequently withdrawn pending investigation of alternative routings. The Statements were written by Polar Gas staff with assistance of senior socio-economic consultants.

Reports: The Socio-Economic Statement consists of the following:

Volume V, Public Interest, Part B, Socio-Economic Statement, Northwest Territories, 7 Chapters and Table Supplement.

Volume V, Public Interest, Part C, Socio-Economic Statement, Manitoba and Ontario, 6 Chapters and Table Supplement.

Copies have been distributed to appropriate government agencies and the National Science Library.

Time Frame: Filed 1978; withdrawn 1979.

Undertaken By: Polar Gas staff and senior socio-economic consultants.

Contact: K.G. Taylor, Supervisor
Environmental Programs
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Project: POLAR GAS PROJECT
Biophysical Research and Data Collection -
West Hudson Bay Route

Geographic Areas: Proposed Pipeline Route: Melville Island to Cornwallis Island via Bathurst Island; Barrow Strait; Somerset Island; Boothia Peninsula; to Longlac, Ontario via vicinities of Spence Bay and Baker Lake, NWT; Churchill, Manitoba; and Pickle Lake, Ontario.

Objectives: The Polar Gas Biophysical (Environmental) Research Program was designed to establish the data base essential for a comprehensive Environmental Statement on the effects of a proposed natural gas pipeline from the Arctic Islands to southern Canada.

Approach/Progress: Most studies were carried out by independent contractors under the general direction of the project's senior biophysical consultants.

Reports: A total of 63 reports were published during the program. All reports have been distributed to appropriate government agencies, regional special interest groups, the National Science Library, and selected research libraries across the country. Reports are also available from Polar Gas on request. See list of reports attached.

Time Frame: 1973-1978

Undertaken By: Consultants/Contractors to Polar Gas

Contact: K.G. Taylor, Supervisor
Environmental Programs
Polar Gas Project
P.O. Box 90,
Commerce Court West
Toronto, Ontario M5L 1H3

Project: POLAR GAS PROJECT
Biophysical Research and Data Collection -

Study 1973-1978
Reports:

1973 Pluritec Consultants Ltd. 1973. Physical Characteristics Section. Volume 1 - Annotated Bibliography. Volume 2 - Synthesis and Recommendations. Volume 2, 306 p.; Volume 2, 30 p.

Waltz, D. and L. Thibodeau. 1973. Ecological Vegetation Study. University of Montreal, Centre de Recherches Ecologiques de Montreal. 239 p.

Renewable Resources Consulting Services Ltd. 1973. Preliminary Land Mammal Study. 123 p.

Davis, R.A., C. Holdsworth, and W.J. Richardson. 1973. Present Ornithological Knowledge and Suggested Research Programs for the Polar Gas Pipeline Project. LGL Limited. Volume 1, Parts 1 and 2. 245 p. Volume 2.

T.W. Beak Consultants Ltd. 1973. Freshwater Resources. 39 p.

Lalli, C.M., R. Buchanan, D. Thomson and F. Wells, Jr. 1973. marine Ecology Report. McGill University, Office of Industrial Research, Marine Sciences Centre. 98 p.

1974 Montreal Engineering Co. Ltd. 1975. A Reconnaissance Biophysical Survey along the Proposed Route of the Polar Gas Pipeline on the Boothia Peninsula, Somerset Island, Cornwallis and Little Cornwallis Islands, NWT., 1974. 104 p.

Renewable Resources Consulting Services Ltd. 1974. A Study of Land Mammals in the High Arctic, 1974; a preliminary interim report. 107 p.

Renewable Resources Consulting Services Ltd. 1975. A Study of Land Mammals in the High Arctic, 1974; a supplement completing the interim report. 60 p.

Davis R.A., K. Finely, M. Bradstreet, C. Holdsworth, M. McLaren, and W.J. Richardson. 1975. Studies of the Numbers and Distribution of Birds in the Central Canadian Arctic 1974; a preliminary interim report. 2 volumes. LGL Limited. 102 p.

Davis, R.A., K. Finley, M. Bradstreet, C. Holdsworth, M. McLaren. 1975. Studies of the Numbers and Distribution of Birds and Marine Mammals in the Central Canadian Arctic, 1974. A supplement completing the interim report. LGL Limited. 205 p.

Sekerak, A.D. and F.F. Graves. 1975. Investigation of Aquatic Resources Along Proposed Polar Gas Pipeline Routes North of Spence Bay, N.W.T., 1974; a preliminary interim report. Aquatic Environments Ltd. 51 p. plus Appendices and Maps.

Sekerak, A.D. and F.F. Graves. 1975. Investigation of Aquatic Resources Along Proposed Polar Gas Pipeline Routes North of Spence Bay, N.W.T., 1974. 2 volumes. Aquatic Environments Ltd. 189 p.

Thomson, D. 1974. Marine Ecology. Preliminary interim report. McGill University, Marine Sciences Centre. 27 p.

Finley, K.J., R.A. Davis, and W.J. Richardson. 1974. Preliminary Studies of the Numbers and Distribution of Marine Mammals in the Central Canadian Arctic, 1974. LGL Limited. 68 p.

Thomson, D., S. Woods, and J. Acreman. 1975. Marine Ecology Survey in the Central Portion of the Canadian Arctic Islands, 1974. McGill University, Marine Sciences Centre. 77 p.

1975

Gubbe, D.M. (ed.) 1976. Landscape Survey, District of Keewatin, N.W.T., 1975. R.M. Hardy & Associates Ltd. 227 p.

Fischer, C.A., and E.A. Duncan. 1976. Ecological Studies of Caribou and Muskoxen in the Arctic Archipelago and Northern Keewatin, 1975. Renewable Resources Consulting Services Ltd. 194 p.

Alliston, W.G., M.S.W. Bradstreet, M.A. McLaren, R.A. Davis, and W.J. Richardson. 1976. Numbers and Distribution of Birds in the Central District of Franklin, N.W.T. June-August, 1975. 2 volumes. LGL limited. 583 p.

McLaren, P.L., R.A. Davis, W.E. Renaud, and C. Holdsworth. 1976. Studies of the Numbers and Distribution of Birds in the District of Keewatin, N.W.T. June-August, 1975. 2 volumes. LGL Limited. 591 p.

McLeod, C.L., P.J. Wiebe, and R.A. Mohr. 1976. An Examination of Aquatic Ecosystems in the Baker Lake - Lower Thelon River, N.W.T. Area in Relation to Proposed Polar Gas Pipeline Development. Renewable Resources Consulting Services Ltd. 68 p.

Sekerak, A.D., D. Thomson, H. Bain, and J. Acreman. 1976. Summer Surveys of the Marine Ecology of Creswell Bay, Somerset Island and Assistance Bay, Cornwallis Island, N.W.T. 1975. LGL Limited. 215 p.

Finley, K.J. Studies of the Status of Marine Mammals in the Central District of Franklin, N.W.T., June-August, 1975. LGL Limited. 183 p.

Alliston, W.G. 1976. A Summary of Research on Birds, Marine Mammals and Marine Ecology in the Districts of Franklin and Keewatin, N.W.T., 1974 and 1975. LGL Limited. 90 p.

1976

Kolomeychuk, R.J. 1977. Determination of Gaseous Emissions from Polar Gas Activities and Facilities. Dames and Moore.

Steen, O.A. (ed.) 1977. Landscape Survey, district of Franklin, N.W.T., 1976. R.M. Hardy & Associates Ltd.

James, D.A. (ed.) 1977. Landscape Reconnaissance, Provinces of Manitoba and Ontario, 1976. R.M. Hardy & Associates Ltd.

Nicholson, W. and W. Younkin. 1977. Preliminary Reclamation Studies. R.M. Hardy & Associates Ltd.

Fischer, C.A., D.C. Thompson, R.L. Wooley and P.S. Thompsen. 1977. Ecological Studies of Caribou on the Boothia Peninsula and in the District of Keewatin, N.W.T., 1976. Renewable Resources Consulting Services Ltd.

Fischer, C.A., G.L. Fisher, G.H. Klassen and D.C. Thompson. 1977. Studies of Moose and Woodland Caribou in Northeastern Manitoba and Northwestern Ontario. Renewable Resources Consulting Services Ltd.

Thompson, P.S. and C.A. Fischer. 1977. Studies of Furbearers in Northeastern Manitoba and Northwestern Ontario. Renewable Resources Consulting Services Ltd.

McLaren, P.L., M.A. McLaren and L.A. Patterson. 1977. Numbers and Distribution of Birds during Migration in the District of Keewatin, Northern Manitoba and Northwestern Ontario, 1976. LGL Limited. 283 p.

McLaren, M.A., P.L. McLaren, and W.G. Alliston. 1977. Bird Populations in the Rasmussen Basin Lowlands, N.W.T., June-September 1976. LGL Limited.

Bradstreet, M.S.W. 1977. Feeding Ecology of Seabirds Along Fast-Ice Edges in Wellington Channel and Resolute Passage, N.W.T. LGL Limited. 149 p.

Bradstreet, M.S.W. and K.J. Finley. 1977. Distribution of Birds and Marine Mammals Along Fast-Ice Edges in Barrow Strait, N.W.T. LGL Limited.

Hatfield, C.T., G.R. Peterson, W. Bengeyfield, G.L. Williams and G.M. Smith. 1977. Survey of Selected Living Aquatic Resources Along the Proposed Polar Gas Pipeline Route from Spence Bay, N.W.T., to Longlac, Ontario 1976. 3 volumes. Hatfield Consulting Limited. 117 p.

Bain, H., D. Thomson, M. Foy and W. Griffiths. 1977. Marine Ecology of Fast-Ice Edges in Wellington Channel and Resolute Passage, N.W.T. LGL Limited. 262 p.

Sekerak, A.D. and W.J. Richardson. 1978. Studies of the Ecology of Fast-Ice Edges in the High Arctic. LGL Limited.

Finley, K.J. and G. Johnston. 1977. An Investigation of the Distribution of Marine Mammals in the Vicinity of Somerset Island with Emphasis on Bellot Strait, August-September 1976. LGL Limited. 89 p.

Polar Gas Project. 1978. Wildlife Habitat Map Series.

Peterson, E.B. 1977. Environmental Overview of the Winnipeg Alternative, Polar Gas Project. Part 1 - Annotated Bibliography, Part 2 - Analysis and Summary. Western Ecological Services Ltd. Part 1, 331 p. Part 2, 13 p.

Scheledermann, P. and R.J. Nash. 1977. Archaeological Overview of the Regions Along the Proposed Polar Gas Pipeline Route. The Arctic Institute of North America. 192 p.

Polar Gas Project. 1977. Land Use Atlas. Melville Island, Northwest Territories to Longlac, Ontario.

Collins, D.H. 1977. Palaeontological Sites and Areas Within the Vicinity of the Polar Gas Route. Royal Ontario Museum.

1977

Nicholson, W.E., D.L. Johnson and W.E. Younkin. 1978. Preliminary Reclamation Studies Polar Gas Project, 1977. R.M. Hardy and Associates Ltd.

James, D.A. (ed.) 1978. Landscape Survey Province of Ontario, 1977. R.M. Hardy and Associates Ltd.

Reid, D.A. and D.M. Gubbe. 1978. Landscape Survey, Province of Manitoba. R.M. Hardy and Associates Ltd.

Thompson, D.C., G.H. Klassen, C.A. Fischer. 1978. Ecological Studies of Caribou in the Southern District of Keewatin, 1977. Renewable Resources Consulting Services Ltd.

McLaren, P.L. and M.A. McLaren. 1978. Studies of Terrestrial Bird Populations in Northwestern Ontario and Northern Manitoba, June 1977. LGL Limited.

McLaren, P.L. and C. Holdsworth. 1978. summer Bird Populations in the Pitz Lake-Baker Lake Area, District of Keewatin, N.W.T. LGL Limited.

McLaren, P.L. 1978. Summer Bird Populations in Chesterfield Inlet, District of Keewatin, N.W.T. LGL Limited.

Alliston, W.G. and L.A. Patterson. 1978. A Preliminary Study of Peregrine Falcon Populations in the Polar Gas Area, Districts of Franklin and Keewatin, N.W.T. LGL Limited.

Patterson, L.A. and W.G. Alliston. 1978. Breeding Bird Surveys at Selected Sites on Southern Somerset Island and Boothia Peninsula, July 1977. LGL Limited.

Bain, H. and A.D. sekerak. 1978. Aspects of the Biology of Arctic Cod (*Boreogadus saida*) in the central Canadian Arctic. LGL Limited.

Thomson, D., Wm.E. Cross, H. Bain and L. Patterson. 1978. Aspects of the Spring and Summer Marine Environment of Brentford Bay, Boothia Peninsula, N.W.T. LGL Limited.

Salter, R.E. 1978. Normal Behaviour and Disturbance Responses of Walruses (*Odobenus rosmarus* L.) During Terrestrial Haul-Out, Eastern Bathurst Island, N.W.T., July-August 1977. LGL Limited.

Davis, R.A., W.R. Koski and K.J. Finley. 1978. Numbers and Distribution of Walruses in the Central Canadian High Arctic. LGL Limited.

Finley, K.J. 1978. Behaviour and Densities of Ringed Seals (*Phoca hispida*) During Haul-Out in the High Arctic, June 1977. LGL Limited.

Hatfield, C.T., G.R. Peterson, Wm. Bengeyfield, G.L. Williams, G.M. Smith and M.B. Winsby. 1978. Survey of Selected Living Aquatic Resources Along the Proposed Polar Gas Pipeline Route from Melville Island, N.W.T. to Longlac, Ontario. 1977. 3 volumes. Hatfield Consulting Limited.

Peterson, G.R., G.M. Smith and L. Bodnaruk. 1978. Some Short-Term Effects of Experimental Trenching On Two Streams in the Caribou River Drainage, Manitoba, 1977. Hatfield Consulting Limited and Northwest Hydraulic Consultants Ltd.

Schledermann, P. 1978. Distribution of Archaeological Sites in the Vicinity of the Proposed Polar Gas Pipeline and Staging Areas, N.W.T. The Arctic Institute of North America.

Kolomeychuk, R.J. 1978. Noise Level and Ground Vibration Measurements During Polar Gas Construction Methods Program. The Environmental Applications Group Limited.

Peterson, E.B. 1978. Environmental and Land use Comparisons of Alternative Routes. Polar Gas project. Western Ecological Services Ltd.

Project: POLAR GAS PROJECT
Socio-Economic Research and Data Collection -
West Hudson Bay Route

Geographic Areas: Proposed Pipeline Route: Melville Island to Cornwallis Island via Bathurst Island; Barrow Strait; Somerset Island; Boothia Peninsula; to Longlac, Ontario via vicinities of Spence Bay and Baker Lake, NWT; Churchill, Manitoba; and Pickle Lake, Ontario.

Objectives: The Polar Gas Socio-Economic research program was designed to establish the data base essential for a comprehensive Socio-Economic Statement on the effects of a proposed natural gas pipeline from the Arctic Islands to southern Canada.

Approach/Progress: Most studies were carried out by independent contractors under the general direction of the project's senior socio-economic consultants.

Reports: A total of 21 reports were published during the program. All reports have been distributed to appropriate government agencies, regional special interest groups, the National Science Library, and selected research libraries across Canada. Reports are also available from Polar Gas on request. See list of reports attached.

Time Frame: 1973-1978

Undertaken By: Consultants/Contractors to Polar Gas

Contact: K.G. Taylor, Supervisor
Environmental Programs
Polar Gas Project
P.O. Box 90,
Commerce Court West
Toronto, Ontario M5L 1H3

Study 1973-1978
Reports:

1973 Gourdeau, E. 1973. Notes on the Human Setting in the Area to be Traversed by a Proposed Polar Gas Pipeline Going from Ellef Ringnes Island to Southern Markets. The Arctic Institute of North America.

1976 Freyman, A.J. and I.D. Wilson. 1977. Mineral Exploration and Development in the Central Arctic - Keewatin Region. Recent Trends and Future Situation with and Without the Polar Gas Project. Minec-Consult Ltd.

* Hobart, C.W. 1977. Staffing Recommendations for the Polar Gas Pipeline. Hobart, Walsh and Associate Consultants Limited.

Kemp, W.B., G. Wenzel, N. Jensen and E. Val. 1977. The Communities of Resolute and Kuvialuk: A Social and Economic Baseline Study. McGill University, Office of Industrial Research.

Govier, G.T. and R.E. Mayne. 1977. Settlements of the Central Arctic - Keewatin Region: Community Profiles and Regional Hierarchies. 2 volumes. Underwood McLellan & Associated Ltd.

Merrett, J.S. 1977. State-of-the-Art Review of Experience to Date in Assessing the Socio-economic Effects of Northern Pipeline Projects as of Mid-1976. M.P.S. Associates Ltd.

Stager, J.K. 1977. Baker Lake, N.W.T. A Background Report of its Social and Economic Development. University of British Columbia.

Taunton, G.F. and R.W. Fenton. 1977a. Background Information on the Resource Harvesting Economy in the Polar Gas Study Region, Northwest Territories, 1976. InterGroup Consulting Economists Ltd.

Taunton, G.F. and R.W. Fenton. 1977b. Labour Force, Employment and Income Information for the Polar Gas Study Region, Northwest Territories, 1976. InterGroup Consulting Economists Ltd.

* This report was not printed.

1977

Williamson, R.G. 1977. The Boothia Peninsula People: Social Organization in Spence Bay, N.W.T. University of Saskatchewan, Institute for Northern Studies.

Hobart, C. 1978. Work Aspirations and Physical Mobility Interests of Young Inuit in Gjoa Haven, N.W.T. Hobart, Walsh and Associate Consultants Limited.

Irwin, N.A. (Study Director). 1978. Socio-Economic Baseline study of Northwestern Ontario. 2 volumes. IBI Group.

Knowles, J.A. (Study Director). 1978. Socio-Economic Analysis and Projections for Gillam, Bird and Sundance. Underwood McLellan (1977) Ltd.

McEachern, John. 1978. A Survey of Resource Harvesting, Eskimo Point, N.W.T., 1975-1977. Quest Socio-Economic Consultants Inc.

McIlveen, D. 1978. Preliminary Study of Resource Harvesting in Areas Along the Polar Gas Route in Northeastern Manitoba and Northwestern Ontario, 1977. D. McIlveen.

McSkimming, R. and J.K. Stager. 1978. Chesterfield Inlet, N.W.T. A Background Report on its Social and Economic Development. Dove Inc. Research and Consulting; Univeristy of British Columbia.

Martin, P. 1978. Nakina-Aroland Socio-Economic Analysis and Projections. M.M. Dillon Limited.

Martin, P. 1978. Pickle Lake - Savant Lake Socio-Economic Analysis and Projections. M.M. Dillon Limited.

Owen, T. (Study Director). 1978. Northwestern Ontario Socio-Economic Analysis and Projections. IBI Group.

Paulson, P.M., P.U. Rutgers and M. Strong. 1978. Northern Manitoba: Socio-Economic Projections, 1977-1991. Strong Hall & Associated Ltd.

Taunton, G.F. 1978. Baseline Socio-Economic Profile of Northern Manitoba. InterGroup Consulting Economists Ltd.

Project: POLAR GAS PROJECT
Environmental Statement - "Y" Line to Longlac Route

Geographic Areas: Proposed Pipeline Route: A lateral from Melville Island to the vicinity of Coppermine via M'Clure Strait, Victoria Island, and Dolphin and Union Strait; a lateral from the Mackenzie Delta/Beaufort Sea to the vicinity of Coppermine; a main line from the vicinity of Coppermine to Longlac, Ontario, via the vicinities of Artillery Lake, NWT; Gillam, Manitoba; and Pickle Lake, Ontario.

Objectives: An Environmental Statement is being prepared as part of an anticipated application to government regulatory agencies for permission to build a natural gas pipeline from the Arctic Islands and the Mackenzie Delta to southern Canada.

Approach/Progress: A draft Environmental Statement is well advanced. Work is being carried out by Polar Gas staff and consultants.

Reports: Not yet available.

Time Frame: Filing of application anticipated 1983.

Undertaken By: Polar Gas staff assisted by senior socio-economic consultants

Contact: K.G. Taylor, Supervisor
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Toronto, Ontario M5L 1H3

Project: POLAR GAS PROJECT
Socio-Economic Statement - "Y" Line to Longlac Route

Geographic Areas: Proposed Pipeline Route: A lateral from Melville Island to the vicinity of Coppermine via M'Clure Strait, Victoria Island, and Dolphin and Union Strait; a lateral from the Mackenzie Delta/Beaufort Sea to the vicinity of Coppermine; a main line from the vicinity of Coppermine to Longlac, Ontario, via the vicinities of Artillery Lake, NWT; Gillam, Manitoba; and Pickle Lake, Ontario.

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Time Frame: Filing of application anticipated 1983.

Undertaken By: Polar Gas staff assisted by senior socio-economic consultants

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P.O. Box 90,
Commerce Court West
Toronto, Ontario M5L 1H3

Project: POLAR GAS PROJECT
Biophysical Research and Data Collection -
"Y" Line to Longlac

Geographic Areas: Proposed Pipeline Route: A lateral from Melville Island to the vicinity of Coppermine via M'Clure Strait, Victoria Island, and Dolphin and Union Strait; a lateral from the Mackenzie Delta/Beaufort Sea to the vicinity of Coppermine; a main line from the vicinity of Coppermine to Longlac, Ontario, via the vicinities of Artillery Lake, NWT; Gillam, Manitoba; and Pickle Lake, Ontario.

Objectives: The Polar Gas Biophysical (Environmental) Research Program was designed to establish the data base required for an Environmental Statement on the effects of a proposed natural gas pipeline from the Arctic Islands and the Mackenzie Delta to southern Canada.

Approach/Progress: Studies were carried out by independent contractors under the general direction of the project's senior biophysical consultants. The field program in 1980/81 focussed on Victoria Island and the region north of Great Bear Lake.

Reports: A total of 13 reports have been published to date. All reports have been distributed to appropriate government agencies, regional special interest groups, the National Science Library, and selected research libraries across Canada. A limited number of copies are also available on request from Polar Gas. See list of reports attached.

Time Frame: Beginning 1979; continuing.

Undertaken By: Consultants/Contractors to Polar Gas

Contact: K.G. Taylor, Supervisor
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Project: POLAR GAS PROJECT
Biophysical Research and Data Collection -
"Y" Line to Longlac

Study 1979-1982
Reports:

1979 Peterson, E.B. and V.M. Levson. 1979. Environmental Overview of a Possible Polar Gas "Y" Line. Part 1 - Annotated Bibliography, Part 2 - Analysis and Summary. Western Ecological Services Ltd. Part 1, 494 p. Part 2, 38 P.

1980 Peterson, E.B., R. Kabzems and V.M. Levson. 1980. Environmental Overview of a Possible Polar Gas East Franklin Route. Part 1 - Annotated Bibliography, Part 2 - Analysis and Summary. Western Ecological Services Ltd. Part 1, 647 p. Part 2, 26 p.

Banfield, A.W.F. and R.D. Jakimchuk. 1980. Analyses of the Characteristics and Behaviour of Barren-Ground Caribou in Canada. Rangifer Associates Environmental Consultants and R.D. Jakimchuk Management Associates Ltd. (three parts):

- Notes on Caribou Distribution, Abundance and Use in the Northwest Territories, 1933-1949. A.W.F. Banfield.
- An Overview of Five Major Herds of Barren-Ground Caribou in Canada. R.D. Jakimchuk.
- Disturbance to Barren-Ground Caribou: A Review of the Effects and Implications of Human Developments and Activities. R.D. Jakimchuk.

Kabzems, R. 1980. Monitoring of Revegetation Trials Established for the Polar Gas Project in 1976 and 1977. Western Ecological Services (British Columbia) Ltd.

Schledermann, P. and James W. Helmer. 1980. Archaeological Overview: Proposed Polar Gas Combined Pipeline System. The Arctic Institute of North America.

Jakimchuk, R.D. 1980. Caribou and Muskoxen on Victoria Island, R.D. Jakimchuk Management Associates Ltd.

Williams, G.L., G.M. Smith and C.T. Hatfield. 1981. Survey of Selected Living Aquatic Resources Along the Proposed Polar Gas Pipeline Route on Victoria Island, N.W.T., 1980. Hatfield Consultants Limited.

McLaren, M.A. and W.G. Alliston. 1981. Summer Bird Populations on Western Victoria Island, N.W.T., July 1980. LGL Limited Environmental Research Associates.

Alliston, W.G. and M.A. McLaren. May, 1981. The Distribution and Abundance of Ringed Seals in Western Coronation Gulf, Prince Albert Sound and Minto Inlet, N.W.T., June 1980. LGL Limited, Environmental Research Associates.

Carruthers, D.R. and R.D. Jakimchuk. April, 1981. Terrain and Vegetation Along the Victoria Island Portion of a Polar Gas Combined Pipeline System. Western Ecological Services (British Columbia) Ltd.

Peterson, E.B., R.D. Kabzems and V.M. Levson. Terrain and Vegetation Along the Victoria Island Portion of a Polar Gas Combined Pipeline System. April 1981. Western Ecological Services (British Columbia) Ltd.

Polar Gas Project. An Environmental Reconnaissance of the Missi Falls Alternative Route. September 1981. Edited by L.D. Doran.

Peterson, E.B., R.D. Kabzems, V.M. Levson and M.L. Ward. Environmental Overview of a Portion of the Proposed Polar Gas "Y" Line. October 1981. Western Ecological Services (B.C.) Ltd.

Project: POLAR GAS PROJECT
Socio-Economic Research and Data Collection -
"Y" Line to Longlac

Geographic Areas: Proposed Pipeline Route: A lateral from Melville Island to the vicinity of Coppermine via M'Clure Strait, Victoria Island, and Dolphin and Union Strait; a lateral from the Mackenzie Delta/Beaufort Sea to the vicinity of Coppermine; a main line from the vicinity of Coppermine to Longlac, Ontario, via the vicinities of Artillery Lake, NWT; Gillam, Manitoba; and Pickle Lake, Ontario.

Objectives: The Polar Gas Socio-Economic Research Program was designed to establish the data base required for a Socio-Economic Statement on the effects of a proposed natural gas pipeline from the Arctic Islands and the Mackenzie Delta to southern Canada.

Approach/Progress: Studies were carried out by independent contractors and in-house under the general direction of the project's senior socio-economic consultants. Data has been collected for all communities in the vicinity of the route; studies on resource harvesting have been completed for Victoria Island and Manitoba/Ontario.

Reports: Two reports have been published to date, and have been distributed to appropriate government agencies, regional special interest groups, the National Science Library, and selected research libraries across Canada. A limited number of copies are also available on request from Polar Gas. Community profile data collected in-house will be published as part of the Socio-Economic Statement and is not yet available. See list of reports attached.

Time Frame: Beginning 1979; continuing.

Undertaken By: Consultants/Contractors to Polar Gas

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Project: POLAR GAS PROJECT
Socio-Economic Research and Data Collection -

Study 1979-1982
Reports:

1980 Jacobson, Roy. 1980. Land Use for Resource Harvesting on Victoria Island, Northwest Territories. Kluane Consulting.

1981 Levson, V.M. and Kabzems, R.D. 1981. Renewable Resource Harvesting Along the Proposed Polar Gas Combined Pipeline System in Manitoba and Ontario. Western Ecological Services (B.C.) Limited, Sidney. Report to Polar Gas Project.

In Polar Gas Project. Community Profiles and Data Tables:
Preparation Communities in the vicinity of the Proposed "Y" Line Route to Longlac. To be published as a Supplement to a Socio-Economic Statement.

Project: PRELIMINARY ENVIRONMENTAL ASSESSMENT OF PROPOSED HARBOUR SITES AT MCKINLEY BAY AND BAILLIE ISLANDS.

Geographic Areas: McKinley Bay, Baillie Islands, Beaufort Sea.

Objectives: Assess potential impacts of harbour development on migratory birds and their habitat.

Approach/Progress: Aerial breeding and moulting bird surveys were flown. Ground observations of migratory bird use were made. Vegetation communities were sampled and mapped with the aid of aerial photos. Potential impacts of harbour development and operation on migratory bird use of habitat was assessed. Guidelines for harbour development were recommended.

Reports: Karasiuk, D.J. and P.N. Boothroyd. 1981. Preliminary environmental assessment of proposed harbour sites at McKinley Bay and Baillie Islands, Northwest Territories. Unpublished Canadian Wildlife Service Report. In preparation.

Time Frame: Initial work completed in 1980. Monitoring of McKinley Bay carried out in 1981 (by other personnel). Further monitoring planned for 1982.

Undertaken By: Canadian Wildlife Service, Western and Northern Region

Research Personnel: D.J. Karasiuk, P.N. Boothroyd

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